UNIVERSITY OF CALIFORNIA **ACADEMIC SENATE**

INTERSEGMENTAL COMMITTEE OF THE ACADEMIC SENATES

Tuesday, September 1, 2009
10:00 a.m. – 4:00 p.m.
UCOP, 1111 Franklin Street, Oakland - Room 5320
http://www.universityofcalifornia.edu/senate/

AGENDA

Action	Item		Enclosures
Information 10:00-10:15	**I.**	**Chair's Welcome & Announcements –** *Chair Henry Powell*	**Encl. 1**
Action 10:15-10:20	**II.**	**Consent Calendar –** *Chair Powell* A. Approval of the Agenda B. Approval of June 4, 2009 Meeting Notes	**Encl. 2 tbd**
Information 10:20-11	**III.**	**Reports from Senate Chairs** *Jane Patton, Chair, Academic Senate, CCC* *John Tarjan, Chair, Academic Senate, CSU* *Henry Powell, Chair, Academic Senate UC*	
Information 11:00-11:45	**IV.**	**California Master Plan for Higher Education/ACR 65** *– Chair Powell with Guests:* *John Douglass, Center for Studies in Higher Education, Berkeley* *Todd Greenspan, UC Office of the President* 2010 will mark the 50th anniversary of the Master Plan. ACR 65, introduced but not yet enacted, calls for a legislative commission to review the Master Plan and make recommendations before the end of 2010. Presenters will review the origins of the Master Plan as context for discussion of how the segments might frame its future. Enclosures 3, 4, 5 and 6 are provided for information and background.	**Encls. 3, 4, 5, 6**
11:45-12		**Break & lunch service**	
Discussion 12:00-12:30	**IV.**	**Working lunch: Conversation with UC Interim Provost Pitts** – *Chair Powell* *Guest: Lawrence Pitts, Interim Provost, University of California*	
Information 12:30-1:00	**V.**	**Open Education Resources – Intersegmental Collaboration** *Chair Powell & Guest* *Guest: Catherine Candee, UC Strategic Publishing* UC is collaborating with CCC in developing an open source digital library of approved textbooks and other teaching resources.	

Discussion/ Action 1:00-1:30	**V.**	**ICAS Advocacy Efforts** – *John Tarjan, CSU Senate Chair* What advocacy efforts are or can be planned for Fall 2009? How can the Senates collaborate in advocating for higher education in the near term and looking ahead to Legislative Day in the spring? Should advocacy be framed in the context of the Master Plan? ***ACTION REQUESTED: Adopt an advocacy plan***	
Information /Action 1:30-1:45	**VII.**	**Updated Mathematics Competency Statement** – *Julie Adams, CSU Executive Director* The ICAS statement of mathematics competencies that should be expected of students entering higher education as freshmen has been updated by an intersegmental committee of mathematics faculty. A summary of the changes from the previous version of the statement will be distributed in the near future. ***ACTION REQUESTED: Approve the Statement***	**Encl. 7**
Information 1:45-2:00	**VIII.**	**Intersegmental Enrollment Management** o CSU decision not to admit transfers Spring 2010	
Information/ Action 2:00-3:00	**IX.**	**Transfer Issues** – *Chair Powell and others* *Guest: Sue Wilbur, Director of Admissions, UC* • Update on the Intersegmental Task Force on Transfer -- *Jane Patton & Michele Pilati, CCC, John Tarjan, CSU* • Recommendations for statewide policy on transfer (CSUS) News release attached; link to full report is not active as of 8/27/09 • C-ID & LDTP Updates & Recommendations *Michele Pilati, CCC & Barbara Swerkes, CSU* ***ACTION REQUESTED: TBD***	**Encl. 8**
Information 3:00-3:15	**X.**	**Report: Give Students a Compass Project** – *John Tarjan, CSU Senate Chair*	
Discussion/ Action *as needed*	**XI.**	**New Business**	

Agenda Enclosures:

1. ICAS Roster 2009-10
2. Meeting notes June 4, 2009 – to be distributed
3. California State Assembly Concurrent Resolution #65, amended language
4. Master Plan briefing taken from UCOP web site
5. Pamela Burdman, "Does California's Master Plan Still Work?" *Change*, July/August 2009.
6. Patrick Callan, *California Higher Education, the Master Plan, and the Erosion of Collete Opportunity*, National Center for Policy in Higher Education, 2009.
7. Updated Statement on Competencies in Mathematics Expected of Entering College Students – NB: summary of changes to be distributed

8. Institute for Higher Education Leadership & Policy (CSUS), *Crafting a Student Centered Transfer Process in California: Lessons from Other States*

Important Meeting Information

Location: The September meeting will convene in Room 5320 at the UC Office of the President in downtown Oakland. UCOP is located at 1111 Franklin Street with entries on both Franklin Street and Broadway, between 11th and 12th Streets. Upon arrival, please check in at the security desk where you will be issued a visitor badge. Online directions and a map are available at: [http://www.ucop.edu/services/directions-franklin.html].

If you are flying into the Oakland airport, you may taxi or BART to the UCOP building. For BART, purchase an AirBART shuttle ticket from the ticket machines located at terminal exits or pay exact change ($3.00) on the bus. The shuttle will take you to the Coliseum BART station. From there take a Richmond-bound train and exit at the 12th Street/Oakland City Center Station.

Parking: Visitor parking is available at UCOP on the 12th Street side of the building. The rate is $11.00 per day if you enter the parking structure before 9:00 a.m., $13.00 if you enter after 9:00. Daily parking is also available at a number of lots proximate to the building.

Assistance: For assistance on the day of the meeting, please call Jackie Shelton at 510-987-9143.

INTERSEGMENTAL COMMITTEE OF ACADEMIC SENATES (ICAS)
2009-2010 ROSTER

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INTERSEGMENTAL COMMITTEE OF ACADEMIC SENATES (ICAS)
2009-2010 ROSTER

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INTERSEGMENTAL COMMITTEE OF ACADEMIC SENATES (ICAS)
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Catherine Nelson Member at Large, Academic Senate CSU Professor of Political Science CSU San Francisco 1600 Holloway Avenue San Francisco, CA 94132 707-664-3963 707-664-3920 (Fax) nelsonca@sonoma.edu	STAFF: **Tracy Butler** Interim Program Director Academic Senate, CSU CSU Office of the Chancellor 401 Golden Shore, Suite 139 Long Beach, CA 90802 562-951-4013 562-951-4911 (Fax) tbutler@calstate.edu

AMENDED IN ASSEMBLY MAY 5, 2009

CALIFORNIA LEGISLATURE—2009–10 REGULAR SESSION

Assembly Concurrent Resolution No. 65

Introduced by Assembly Member Ruskin

April 22, 2009

Assembly Concurrent Resolution No. 65—Relative to higher education.

LEGISLATIVE COUNSEL'S DIGEST

ACR 65, as amended, Ruskin. Joint Committee on the Master Plan for Higher Education.

This measure would establish the Joint Committee on the Master Plan for Higher Education. The measure would provide that the joint committee would consist of a number of Assembly Members and Senators to be determined by the Speaker of the Assembly and the Senate Committee on Rules. The committee would be established to review the Master Plan for Higher Education and create a framework to ensure that higher education continues to thrive, among other things. ~~The measure would allow the Senate Committee on Rules and the Assembly Committee on Rules to make money available to the joint committee from their respective operating funds.~~

Fiscal committee: ~~yes~~ *no*.

WHEREAS, Education is the most important function of the State of California and is essential to the cultural, political, and economic health of the state and the nation; and

WHEREAS, California's population is rich in ethnic and cultural diversity, which is a resource that should continually be developed to ensure the ongoing success of the state and its residents; and

WHEREAS, California has developed an extraordinary higher educational system with an unprecedented investment of public and private moneys and the energy and commitment of countless individuals; and

WHEREAS, In 1960, California established a master plan for the development, expansion, and integration of the facilities, curriculum, and standards of higher education in junior colleges, the California State University system, the University of California system, and other institutions of higher education in the state to meet the needs of the state during the 10 years following the master plan's establishment; and

WHEREAS, The 1960 Master Plan for Higher Education was a precedent-setting document that envisioned a place for every Californian, regardless of background or income, and the 2009–10 Master Plan review effort seeks to continue the wisdom and opportunity included by the original framers; and

WHEREAS, The drafters of the 1960 Master Plan for Higher Education foresaw a changing California and a postsecondary education system that would adapt to, meet, and overcome the demands inherent with change; and

WHEREAS, Since the adoption of the 1960 Master Plan for Higher Education, the master plan has been reviewed periodically by the Commission for the Review of the Master Plan for Higher Education, the Coordinating Council for Higher Education, the Joint Committee for Review of the Master Plan in Higher Education, and the California Postsecondary Education Commission; and

WHEREAS, California is at a crossroad as our economy demands a highly skilled workforce, yet a significant number of our next generation are not being prepared to meet our economic demands; and

WHEREAS, The recent economic downturn has taken a toll on the state's fiscal support for public higher education; however, the economy will revive, and this Master Plan review can set a framework for funding priorities when funds become available to restore and increase the state's support for its colleges and universities and invest in preparing its future workforce; now, therefore, be it

Resolved by the Assembly of the State of California, the Senate thereof concurring, That the Legislature of the State of California

hereby establishes the Joint Committee on the Master Plan for Higher Education for the purposes of reviewing the Master Plan for Higher Education and creating a framework to ensure that our higher education system continues to thrive and contribute to a healthy and prosperous future for California and its students; and be it further

Resolved, That the joint committee shall consist of as many members of the Assembly, including one co-chair, as are appointed to the committee by the Speaker of the Assembly, and as many members of the Senate, including one co-chair, as are appointed to the committee by the Senate Committee on Rules, provided that the members appointed from each house shall be appointed in equal number; and be it further

Resolved, That the joint committee and its members shall have and exercise all of the rights, duties, and powers conferred upon investigating committees and their members by the Joint Rules of the Senate and the Assembly as they are adopted and amended from time to time, which provisions are incorporated herein and made applicable to this committee and its members; and be it further

~~*Resolved,* That the Senate Committee on Rules may make money available from the Senate Operating Fund, as it deems necessary, for the expenses of the joint committee and its members. Any expenditure of money shall be made in compliance with policies set forth by the Senate Committee on Rules and shall be subject to the approval of the Senate Committee on Rules; and be it further~~

~~*Resolved,* That the Assembly Committee on Rules may make money available from the Assembly Operating Fund, as it deems necessary, for the expenses of the joint committee and its members. Any expenditure of money shall be made in compliance with policies set forth by the Assembly Committee on Rules and shall be subject to the approval of the Assembly Committee on Rules; and be it further~~

Resolved, That the joint committee is authorized to act until November 30, 2010, at which time the committee's existence shall terminate; and be it further

Resolved, That the joint committee shall submit a report at the end of the legislative session to the Legislature on its activities; and be it further

Resolved, That the Chief Clerk of the Assembly shall transmit copies of this resolution to the author for appropriate distribution.

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Major Features of the California Master Plan for Higher Education

The original Master Plan was approved in principle by the Regents and the State Board of Education (which at that time governed the CSU and the Community Colleges) on December 18, 1959 and was submitted to the Legislature in February 1960. A special session of the 1960 Legislature passed the Donahoe Higher Education Act, which included many of the Master Plan recommendations. Governor Edmund G. (Pat) Brown signed the Donahoe Act into law on April 26, 1960. For various reasons, many of the key aspects of the Master Plan were never enacted into law although agreed to by the segments and the state.

The major features of the Master Plan as adopted in 1960 and amended in subsequent legislative reviews are as follows:

1. Differentiation of functions among the public postsecondary education segments:

- UC is designated the State's primary academic research institution and is to provide undergraduate, graduate and professional education. UC is given exclusive jurisdiction in public higher education for doctoral degrees (with the two exceptions--see CSU below) and for instruction in law, medicine, dentistry, and veterinary medicine (the original plan included architecture).
- CSU's primary mission is undergraduate education and graduate education through the master's degree including professional and teacher education. Faculty research is authorized consistent with the primary function of instruction. SB 724 (2006) authorized CSU to award a specific Doctor of Education (Ed.D.) in educational leadership. Other doctorates can be awarded jointly with UC or an independent institution.
- The California Community Colleges have as their primary mission providing academic and vocational instruction for older and younger students through the first two years of undergraduate education (lower division). In addition to this primary mission, the Community Colleges are authorized to provide remedial instruction, English as a Second Language courses, adult noncredit instruction, community service courses, and workforce training services.

2. Access and differentiation of admissions pools. The establishment of the principle of universal access and choice, and differentiation of admissions pools for the segments:

- UC was to select from among the top one-eighth (12.5%) of the high school graduating class.
- CSU was to select from among the top one-third (33.3%) of the high school graduating class.
- California Community Colleges were to admit any student capable of benefiting from instruction.

Access guarantee. Subsequent policy has modified the Master Plan to provide that all California residents in the top one-eighth or top one-third of the statewide high school graduating class who apply on time be offered a place somewhere in the UC or CSU system, respectively, though not necessarily at the campus or in the major of first choice.

State law affirms the state's commitment to fund all eligible California residents:

> "The University of California and the California State University are expected to plan that adequate spaces are available to accommodate all California resident students who are eligible and likely to apply to attend an appropriate place within the system. The State of California likewise reaffirms its historic commitment to ensure that resources are provided to make this expansion possible, and shall commit resources to ensure that [eligible] students ….. are accommodated in a place within the system." [California Education Code 66202.5]

3. Community college transfer. The transfer function is an essential component of the commitment to access. UC and CSU are to establish a lower division to upper division ratio of 40:60 in order to provide transfer opportunities to the upper division for Community College students. The goal was that UC and CSU would enroll at least one community college transfer student each two freshmen enrolled. All eligible California Community College transfer students are to be provided a place in the upper division and are to be given priority over freshmen in the admissions process.

4. Affordability and fees. The 1960 Master Plan reaffirmed California's prior commitment to the principle of tuition-free education to residents of the state. However, the 1960 Master Plan did establish the principle that students (as well as faculty and staff) should pay fees for auxiliary costs like dormitories, parking, and recreational facilities rather than the state. Because of state general fund reductions in the 1980s and 1990s, fees were increased and used for instruction at UC and CSU, effectively ending the no-tuition policy. However, fee increases have been accompanied by substantial increases in student financial aid.

5. Cal Grant program. The provisions on student aid, now called the Cal Grant program, are designed to ensure that needy and high-performing students have the ability to choose a California institution of their choice, whether it be at UC, CSU, the community colleges, or at one of the independent California colleges and universities. The Cal Grant maximum award level was designed to give students the choice of attending independent California colleges and universities, thereby partially alleviating the demand for spaces in public institutions.

6. Separate governing boards. The establishment of a governance structure for the segments, reaffirming the role of the Board of Regents of UC and establishing a Board of Trustees to oversee CSU and, in 1967, a Board of Governors for the Community Colleges.

7. Higher education coordinating agency. The establishment of a statutory coordinating body, the Coordinating Council for Higher Education, to renew the Master Plan at regular intervals and to coordinate new campuses and new academic offerings among the segments of higher

education. This was replaced in 1973 by the California Postsecondary Education Commission (CPEC).

Major legislative reviews of the Master Plan have been conducted by the Legislature (and occasionally by blue-ribbon commissions) about once a decade since the 1970s and aspects of the Master Plan have evolved since 1960.

The California Master Plan for Higher Education in Perspective

The Master Plan was adopted in 1960, when the "baby boomers" were reaching college age and vast increases in college enrollment were projected for the years 1960-1975. The Master Plan was born of the tremendous pressures to find a way to educate unprecedented numbers of new students, and it succeeded beyond expectations. The Master Plan did much more than that, however. It also helped create the largest and most distinguished system of public higher education in the nation.

It can be argued that there are two major dimensions to this accomplishment:

- The Master Plan arguably transformed a collection of uncoordinated and competing colleges and universities into a coherent system. It achieved this by assigning each public segment—the University of California, the California State University, and the Community Colleges—its own distinctive mission and pool of students. It established a broad framework for higher education that encourages each of the three public segments to concentrate on creating its own distinctive kind of excellence within its own particular set of responsibilities. And from the very beginning the framers of the Master Plan acknowledged the vital role of the independent colleges and universities, envisioning higher education in California as a single continuum of educational opportunity, from small private colleges to large public universities.

- The Master Plan created, for the first time anywhere, a system that combined exceptional quality with broad access for students. This characteristic has made California the envy and exemplar of higher education not only in other states but in nations around the world. A team of international visitors from the Organization for Economic Cooperation and Development, here to review higher education in 1988, noted that California had succeeded in encouraging "constructive competition and cooperation" among its colleges and universities and praised the "complex of creativity" that characterizes California's system of higher education and makes it a model for other nations.

Among the other indicators of the Master Plan's success:

- A much higher proportion of California's population, from every ethnic group and by gender, is in college now than was the case in 1960. Enrollments in public higher education have increased ten-fold (from 179,000 to 1.8 million FTE) since 1960, while the state's population has not even tripled (15.3 to 38.3 million).

- The University of California, the California State University, and the Community Colleges have all grown enormously since 1960 in response to steadily increasing demand for education. UC added four new campuses, the CSU added eight, and the Community Colleges added 47 (from 63 to 110) new colleges.

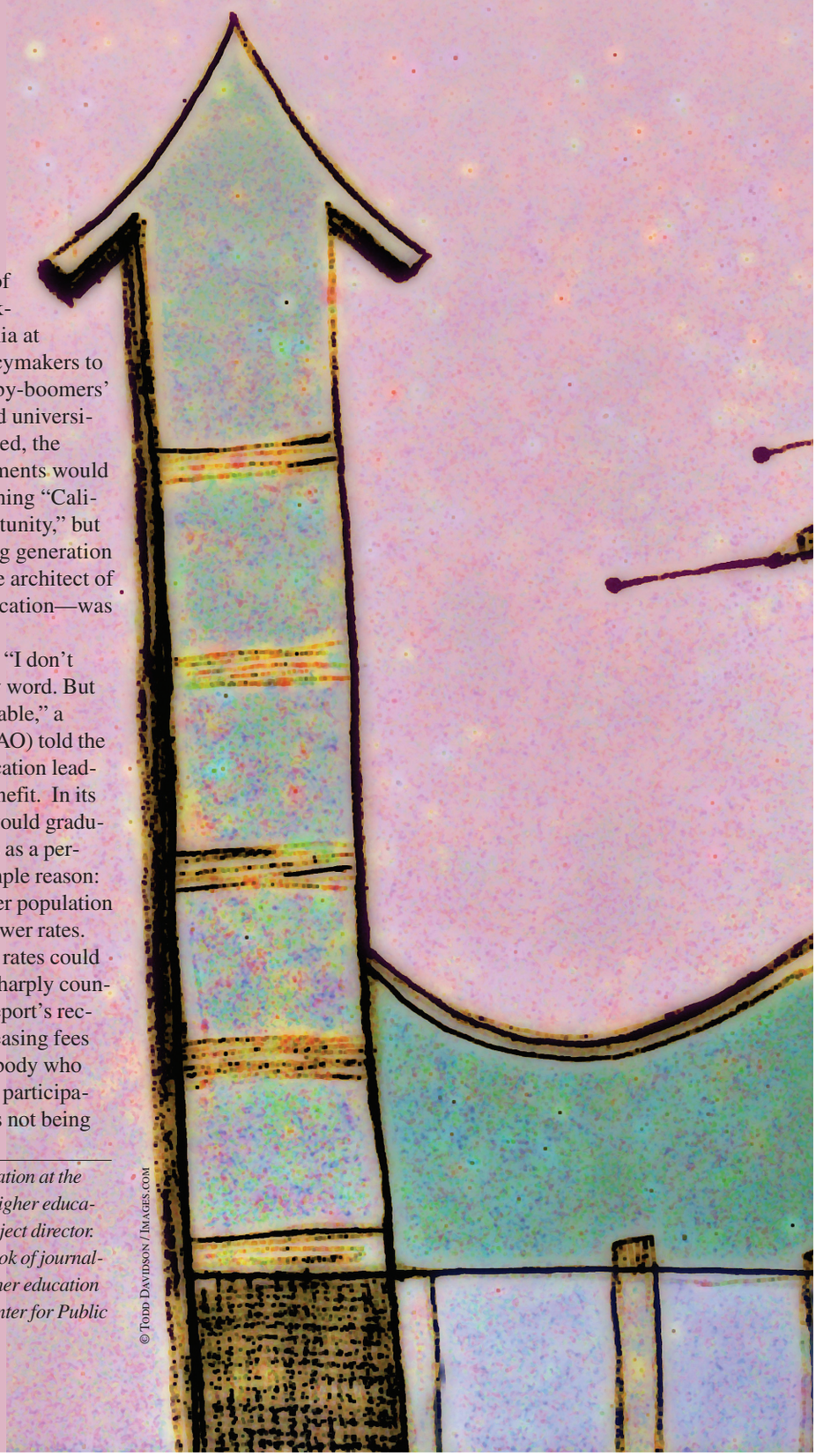
- Despite decades of unprecedented growth, the quality of California's public universities and colleges is considered exemplary.

Here is what Clark Kerr said to the Legislature in 1999, looking back at what has been accomplished:

> "What did we try to do in 1960? First of all, we faced this enormous tidal wave, 600,000 students added to higher education in California in a single decade. There were new campuses that had to be built, faculty members that had to be hired, and so forth, and it looked like an absolutely enormous, perhaps even impossible, challenge before us. We started out in our Master Plan asking the state to commit itself, despite the size of this enormous tidal wave, to create a place in higher education for every single young person who had a high school degree or was otherwise qualified so that they could be sure, if they got a high school degree or became otherwise qualified that they would have a place waiting for them. That was our first and basic commitment. I might say it was the first time in the history of any state in the United States, or any nation in the world, where such a commitment was made -- that a state or a nation would promise there would be a place ready for every high school graduate or person otherwise qualified. It was an enormous commitment and the basis for the Master Plan."
> [http://www.ucop.edu/acadinit/mastplan/kerr082499.htm]

Does California's Master Plan Still Work?

By Pamela Burdman



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In the latter half of the 1990s, a series of reports bearing sober titles like "Breaking the Social Contract" and "California at the Crossroads" urged California policymakers to prepare for the imminent arrival of baby-boomers' children at the doors of the state's colleges and universities. If the state wasn't ready, the reports warned, the consequences of the predicted surge in enrollments would be dire. One referred to a "hurricane" threatening "California's historic commitment to college opportunity," but the metaphor that came to stand for the coming generation of college students—coined by Clark Kerr, the architect of California's 1960 Master Plan for Higher Education—was Tidal Wave II.

Some in Sacramento dismissed the rhetoric. "I don't know who's calling it a tidal wave. It's a catchy word. But it's a poor metaphor. A tidal wave is uncontrollable," a staffer with the Legislative Analyst's Office (LAO) told the *San Francisco Chronicle*, accusing higher education leaders of inflating the projections for their own benefit. In its analysis, the LAO concluded that enrollment would gradually increase but that college participation rates as a percentage of the population would drop, for a simple reason: Latinos, who were growing faster than any other population segment, would continue to attend college at lower rates.

The assumption that those low participation rates could not be nudged up by public policy action was sharply countered by higher education experts, as was the report's recommendation to "manage" enrollment by increasing fees and tightening admissions requirements. "Anybody who would say, as a matter of public policy, that the participation rates among blacks and Latinos are okay is not being

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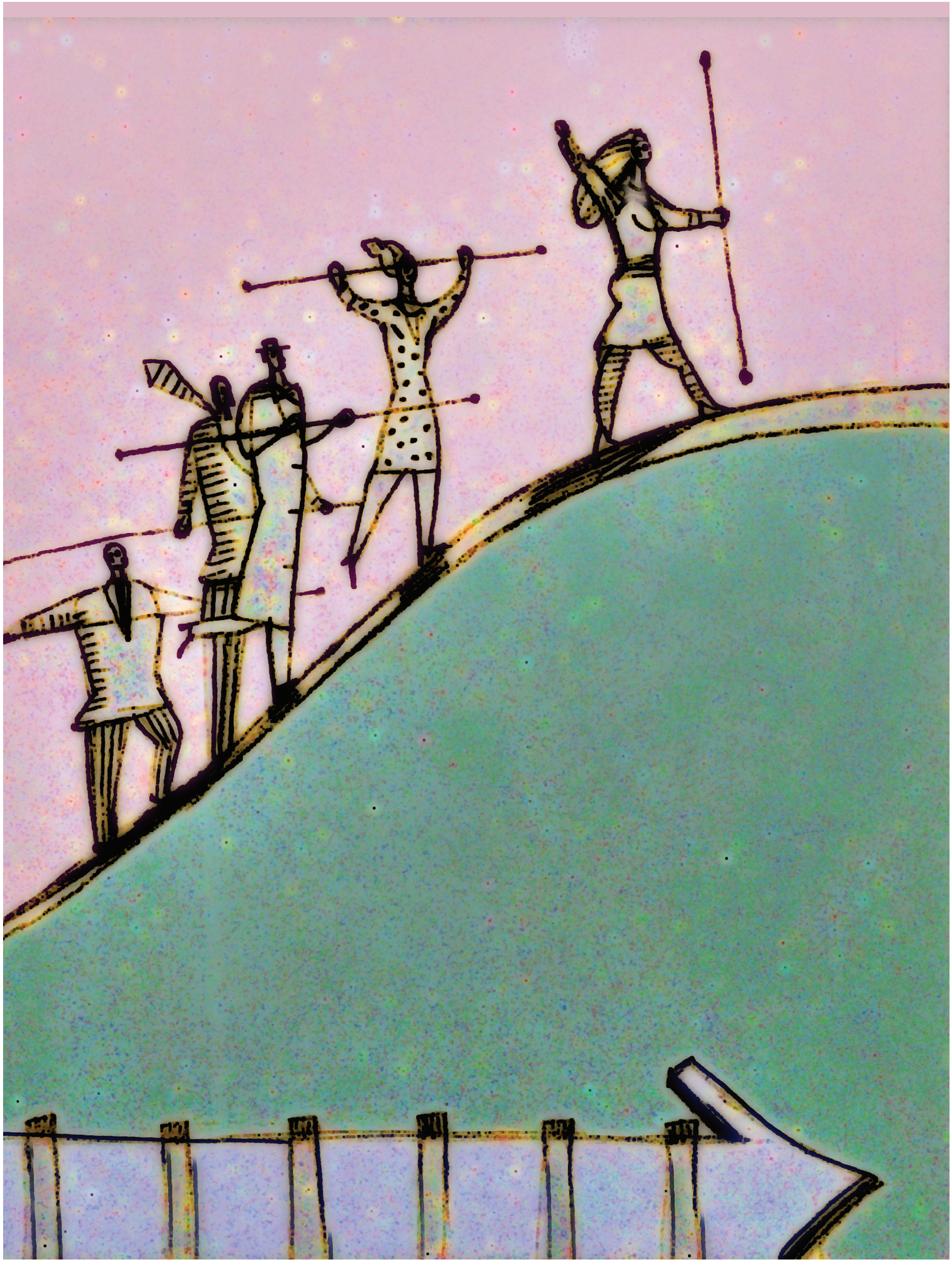
Pamela Burdman, currently a program officer in Education at the William and Flora Hewlett Foundation and a former higher education reporter, joins WestEd this summer as a senior project director. *The initial version of this article was prepared for a book of journalistic accounts of recent developments in American higher education to be published under the auspices of The National Center for Public Policy and Higher Education.*



realistic about the needs of this state," noted Jerry Hayward, a retired chancellor of the state's community college system.

A decade later, the tidal wave had yet to hit shore. By 2005, the year that many of the reports used in their analyses, California's public higher education institutions were enrolling roughly 200,000 students fewer than the higher projections had suggested, This was the result of a couple of worrisome trends:

• A sharp drop in the percentage of students going to college directly after high school. In 1985, about 58 percent of California's high school graduates went straight into a public institution of higher education (the majority into a community college). Twenty years later, the figure had dropped to 46 percent, according to the California Postsecondary Education Commission (CPEC).

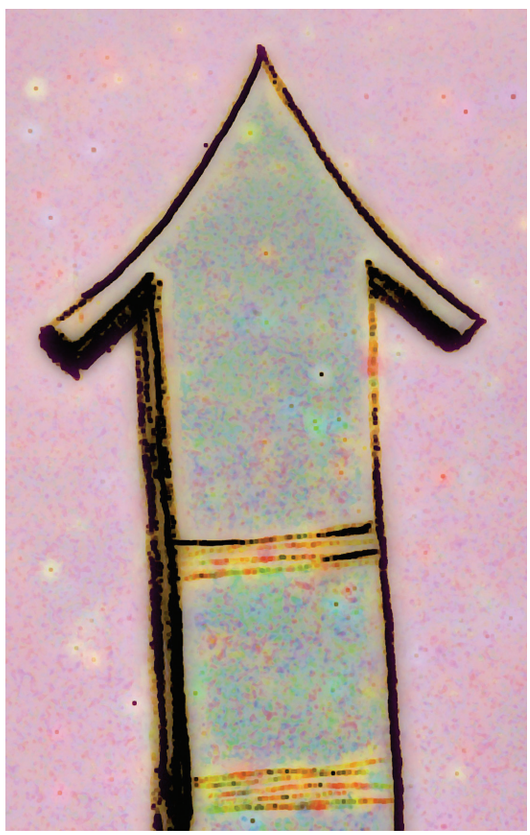
• A continued racial gap in both high school graduation and college participation. Latinos and African-American ninth-graders continued to be much less likely to attend college than white and Asian students (and those who did were much less likely to earn a degree).

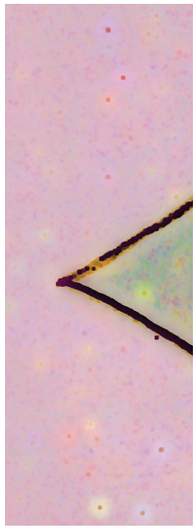
The result has been a decline in the state's overall education level. In earlier generations, the Golden State was known for its high education levels—only three states have an over-65 population that is better educated. But among 25-to-34-year-olds, California is now in the bottom half in baccalaureate attainment. In fact, California's early and pronounced slide is a major contributor to falling education levels nationwide. The trend is particularly troubling when contrasted with increasing education rates in other countries.

"People are having a hard time understanding that California is not still at the top of the heap," said John Douglass, an educational historian at the University of California, Berkeley. "Most people have no idea that we have such low BA production rates."

So was the Sacramento analyst right in insisting that no tidal wave was coming? Or did fee increases and admissions restrictions at the state's four-year universities effectively "manage" enrollments away? Or were the lower numbers a case of a self-fulfilling prophecy, in which the state's failure to prepare for escalating enrollments or to stimulate minority college-going effectively curtailed access, as the reports had warned? And is the tidal wave's absence from higher education, for whatever reason, largely responsible for the declining education levels in the state? Or are low completion rates to blame?

Each of the suppositions has some merit—and several of them might be true. But answers are scarce when the leadership isn't asking the questions. In the years during which California might have been addressing the crisis, the state's higher education leadership structure appeared to be fraying.





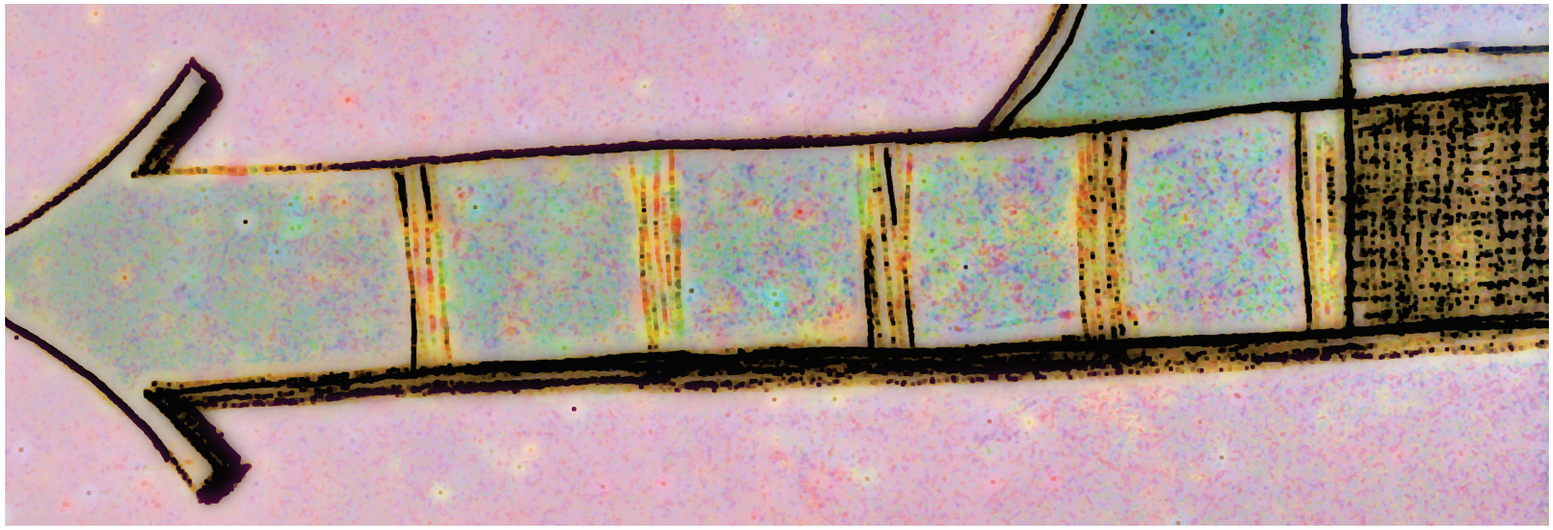
Policy Leadership in Disarray

The California Postsecondary Education Commission (CPEC), never a powerful coordinating body, dwindled from a staffing level of 52 in the early 1990s to just 22 by last year. Only sporadically has a series of education secretaries appointed by Governor Arnold Schwarzenegger even hired a higher education specialist. Meanwhile, a 1990 term-limit law has winnowed the ranks of lawmakers devoted to higher education. "Where's Gary Hart and Al Alquist and John Vasconcellos?" asked Barry Munitz, former CSU Chancellor, recalling some of the previous "legislative lions" for higher education. "There are too many people confused about with whom to even speak to get something done at the state level." By 2008, the legislature's remaining stalwart for higher education, Senator Jack Scott (D-Pasadena), was terming out.

"We have seen state policymaking in the last decade continue to go from pillar to post based solely on short-term political pressures and how many dollars are in the state treasury," noted Steve Weiner, a retired higher education administrator and accrediting official. "As far as I can tell, the leadership of the state of California is completely asleep at the switch when it comes to education, and particularly higher education." Early in 2008, education advocates were still pinning hopes on Governor Arnold Schwarzenegger's promised "year of education in California." But whether the plan even included higher education remained a mystery.

And at that point, leadership transitions and organizational challenges were consuming all the attention at two of the three higher education systems. Interim leaders were heading both the University of California System (UC) and the California Community Colleges (CCC) after the abrupt resignations of the incumbents. UC's Robert Dynes had been pushed out in the wake of damaging exposes on executive compensation practices and a battle with the Regents over the role of the system headquarters. At the 109-campus CCC, Chancellor Marshall Drummond had vacated his Sacramento job to return to his prior post with the Los Angeles community colleges.

The two systems faced opposite problems: UC, which enjoys constitutional autonomy, was dealing with the effects of ten years of bureaucratic accretion, including a 25 percent increase in central office staff, while the CCC had been forced to trim its Sacramento staff by the same percent over the same period.



Even before the budget crisis hit in 2008, the community colleges' system office was employing 130 full-time individuals—fewer than UC's information technology staff alone.

By late 2008, the systems had recruited seasoned leaders in UC's Mark Yudof and the CCC's Jack Scott. But as the state battled what one higher education advocate called "one of the most difficult and contentious budget cycles in the state's history," it was unclear whether either of them—or CSU's Charlie Reed—would have the energy or the ability to tackle higher education's underlying challenges or the weaknesses of the California Master Plan.

The Master Plan

For nearly 50 years, California's higher education system has been shaped by the tripartite division of the vaunted Master Plan. The 1960 document's bold vision of access and quality safeguarded a system of selective research universities (the University of California) and provided baccalaureate education through less-selective campuses (the California State University system), while simultaneously ensuring broad access to higher education through a far-flung network of community colleges. The Master Plan has been credited with the state's superior education level and strong public research universities. But as the 50th anniversary of the Plan approached, a vision that could carry California for the next 50 years had yet to materialize—in part because it would require acknowledging the weaknesses of the very durable existing one.

Though the need for a new plan has been obvious to analysts for more than a decade, there simply has been little appetite for addressing—or even acknowledging—the decline in California's educational capital. The Master Plan focuses on the divisions among the systems but not on the educational needs of the state—and certainly not its needs in the 21st century.

"If you were to have a good policy analyst from the moon come down, they would take a look and say there is not a heck of a lot that has changed over the last ten years."

Meanwhile, instead of strategies to increase education levels, higher education policy discussions over the last decade or so have been consumed with narrower issues: the unraveling of affirmative action at UC in the late 1990s, a series of fee increases beginning in 2003 that shocked students, and controversies related to executive pay at UC and Cal State—not to mention the episodic budget crises. While each of these has important implications for higher education's capacity to meet the needs of the state, more fundamental issues went unaddressed and even unmentioned. The forest (the needs of the state and its students) seemed to have been obscured by the trees (the woes of the three powerful public higher education segments).

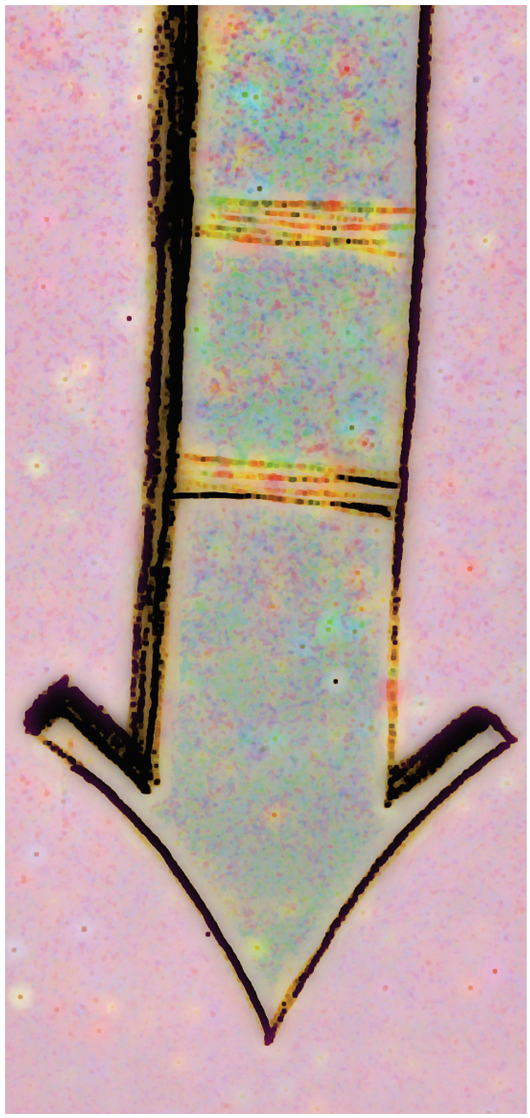
"In the mid-1990s, the state was projected to face a huge tidal wave of new students," said David Longanecker, director of the Western Interstate Commission on Higher Education (WICHE). "So they responded by creating an elite campus in Merced, serving an enrollment of only a few thousand for the foreseeable future, and a specialized campus in Monterey Bay." In addition to UC's Merced campus and Cal State Monterey Bay, one Cal State campus and five community colleges have opened. "That's eight small campuses to serve an influx of 400,000 students," Longanecker pointed out. "If you were to have a good policy analyst from the moon come down, they would take a look and say there is not a heck of a lot that has changed over the last ten years."

Looking in the Wrong Direction

One explanation for the lack of urgency is that state planners and policymakers were looking at the wrong indicators. As of 2007, there were no warning signs of the economic downturn to come. "You're still third on the New Economy Index; you're still the 12th wealthiest economy," Longanecker

told CPEC commissioners at the time. "One of the reasons we see the South making more progress with higher education is because they see themselves as distressed, and the rest of us don't."

In addition, the idiosyncrasies of federal statistics-collection obscure serious deficits in California's performance. While the figures show California ranking among the top dozen states in graduation rates at both two- and four-year institutions, contributing to California's "B" ranking on persistence and completion in *Measuring Up*, they do not account for two factors. First, a much smaller proportion of students there start at four-year universities, so high baccalaureate graduation rates are not sufficient to build a skilled workforce. Since a greater proportion of students go to community colleges, California's success in educating its population is highly dependent on two-year students' earning degrees.



But second, many federal measures exclude part-time students, and California has proportionally 20 percent more part-timers than the nation as a whole, concentrated in the community colleges. Since part-time students complete college at much lower rates, California's high performance on federally collected graduation rates could lull state leaders into overlooking a problem with completion rates, especially in the community colleges.

For example, on national comparisons of three-year graduation rates for community colleges, California ranked third in 2006, with a 46.3 percent graduation rate (because of an apparent change in calculation methodology, California's federally reported graduation rate dropped even lower, to 33 percent, in 2007). But when part-timers are included, only about a quarter of students who want to transfer or complete a degree or credential do so within six years of enrolling, according to several reports. Sadly, the revelation of those more depressing statistics by independent researchers set off a fierce debate among community college insiders about the correct way to calculate transfer and completion rates instead of provoking a call to improve students' success, regardless of how it is measured.

Not surprisingly, when policy discussions do center around the failure of the state's education system, they invariably concentrate on the poor performance of the state's primary and secondary schools. But the relationship between lack of rigorous K-12 preparation and the low collegiate success rates—especially at community colleges—has until recently been off the policy radar. Likewise, much of the media attention has focused not on those rates but on the highest-achieving students and their relative chances of attending the UC's most elite campuses. With three separate routes into to higher education, the attention has been focused on university eligibility (a zero-sum game), even as half of CSU's students and about three-quarters of those going to community colleges fail to pass placement exams for freshman math and English.

"In 1960 our public colleges and universities served a small and homogeneous portion of the young adult population. Today's public colleges and universities must serve a large and diverse population of students whose demographic characteristics and attendance patterns are profoundly different than in 1960," wrote Nancy Shulock, director of the Sacramento State University Institute for Higher Education Leadership and Policy, earlier this decade.

In particular, the role of the CCC has changed dramatically. The idea of a strong system of public two-year colleges, codified in the Master Plan, was initiated in California. In proclaiming that only the top one-third of high school graduates could attend one of the state's universities, the Plan assigned the community colleges the responsibility to serve any student who could benefit from college. As some postsecondary education has become increasingly necessary for anyone wishing to pursue a family-supporting career, the community colleges have become more and more important. But until very recently, the state's vision for the CCC has not included completion. "The Master Plan is access, access, access," noted Charlie Reed of Cal State. "Today it's access and completing the degree and getting out and going into this workforce that California has."

California's community colleges are asked to provide that access and success with fewer resources than those in other states—and with even less per-student funding than the K-12 system. Though state subsidies in California approach the national average, extremely low fees and minimal investment in financial aid put the community college system at a serious disadvantage. The colleges receive roughly $5,500 per student in fees and state funding per year, compared with nearly $7,000 in other western states, according to WICHE. UC and CSU get $22,000 and $12,000 per student, and the K-12 system receives more than $9,000 for each student enrolled.

A Policy Void

Whether those allocations are aligned with state priorities is hard to answer in a state that hasn't set any. An opportunity to make degree completion an explicit goal came and went during the three-year period from 1999 to 2002, when the Master Plan was revisited. Despite state Senator Dede

Alpert's push to overhaul the plan, the final revision barely altered the original version, aside from the addition of sections on K-12 education. And those modest changes were never enacted into law.

Since then, the only significant departure from the Plan has been the 2005 vote of the legislature to allow Cal State to offer doctorates in education. A 2008 proposal surfaced to extend the doctorate to nursing as well. But serious attempts at goal-setting—such as a 2008 higher education accountability bill authored by Jack Scott and vetoed by Schwarzenegger—have gone nowhere.

"California has basically a structural inadequacy in dealing with the educational needs of California and its long-term competitiveness," said Douglass. "I came to this reluctantly, because I've always had a strong sense of the magic and power of California's tripartite structure. California was an innovator that kept doing things to change the system at the margins. In the last 30 years, it's basically not done anything innovative to its higher education system."

What has passed for goal-setting is a series of "compacts" between the state and its four-year universities, guaranteeing funding and fee levels over a four-year period. The four-year institutions favor the compacts because of the predictability they offer. But that seems to be their main virtue.

"There's no teeth in them," noted Shulock. "There are no state priorities. They just require that UC and Cal State report certain things. They don't say we want you to improve transfer or help the state meet its shortage of computer scientists or engineers. The governor just shakes hands with the President of UC and says here's what you're getting. Community colleges don't fit in. They're just micro-managed by the legislature and the Department of Finance."

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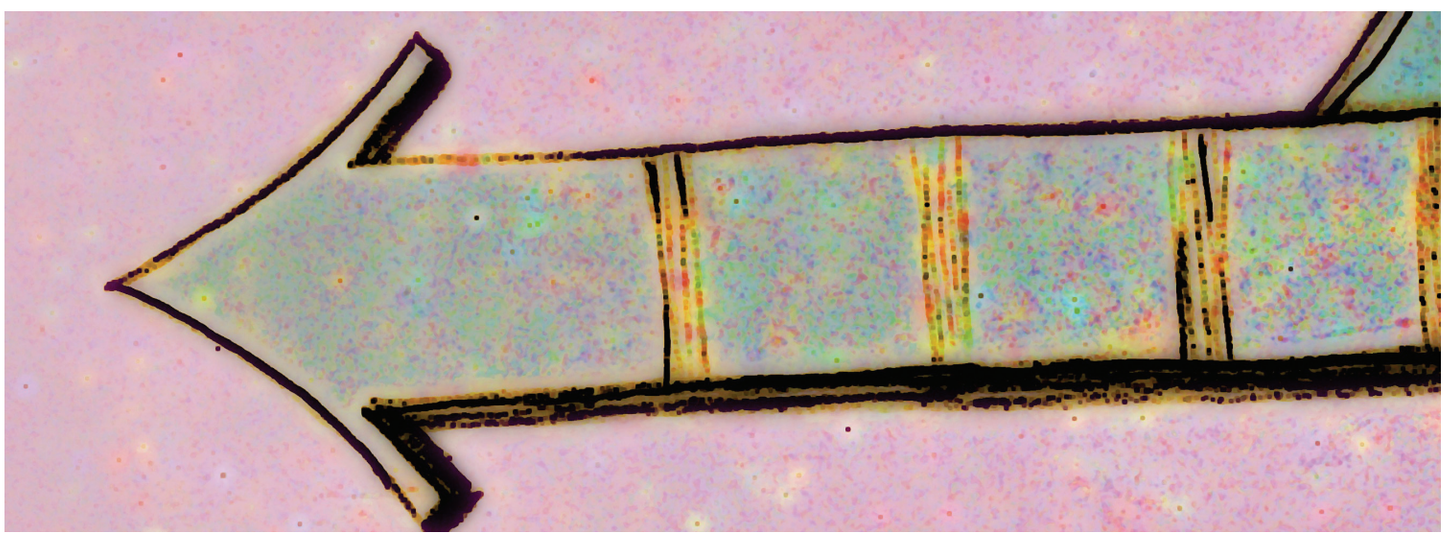
The compacts have not even been effective at ensuring predictable fee increases, at least for the state's four-year institutions. Between AY 1997-1998 and AY 2008-2009, tuition and fees nearly doubled, from $4,212 to $8,027 at UC and from $1,946 to $3,849 at Cal State (as reported by the California Postsecondary Education Commission). Because the state's recent fiscal crisis forced severe cuts, students at both universities will see a fee hike of 9 to 10 percent for 2009-2010—or more if the deepening budget hole forces another increase. But in the end, the compacts could not save the universities from falling into the state's gaping budget hole. Early this year, when the state was short $42 billion and nearly out of cash, a special session of the legislature slashed funding for UC and CSU. Only the community colleges retained a small amount of money for enrollment growth—although not enough to absorb a combined influx of students frozen out of the universities and laid-off workers seeking re-training. Many colleges were seeing enrollment increases of 10 percent or more during the academic year.

Left out of the compacts, the community colleges' budget share continues to be unpredictable and politically hard to defend. Under Schwarzenegger, himself a graduate of Santa Monica College, their fortunes rose modestly. Nevertheless, community college leaders have grown weary of being buffeted by the fortunes of the other systems. They attempted a ballot initiative in 2008 to bring more money into their system, insulate it from K-12 budget decisions, and ensure their portion of the state budget while reducing fees from $20 to $15 per unit.

"It's a response to an untenable situation," said Dale Shimasaki, a veteran higher education political consultant, at the time. "They're trying to figure out a way to get some stability and not have to fight with K-12 all the time. When



you fight adults vs. kids, the kids generally win. It's a loser issue to be boxed in on."

Despite a rare alliance among college presidents, union leaders, faculty, and students (for whom the fee decrease was predictably popular), the initiative ultimately brought the colleges into direct political combat with K-12. Opposition by the state teachers' union—along with both of the university systems, several business organizations, low-tax advocates, and the governor—imperiled the effort, and early word of the impending budget shortfall effectively doomed it.

But even had the initiative passed, it was no more likely to have remedied the overarching problems faced by the state than the compacts had. If anything, the initiative gambit is a symptom of the state's segmented approach. "While other states are mobilizing in response to the state-by-state report cards issued by the National Center for Public Policy and Higher Education, no such activity has occurred in California, because these state-level measures of educational performance do not have any natural audience," noted Shulock in an analysis of California's governance structure.

Underachieving Reforms

Against that backdrop, even the reforms since the mid-1990s that might have addressed some of the systemic problems appear to have had marginal effects at best. For instance, the UC system embarked on various admissions reforms and outreach programs aimed at mitigating the effects of the 1997 prohibition on affirmative action. But the enrollment of the increasing black and Latino student population remained far below their percentage of the state's 18-year-olds. Controversy over UC admissions re-emerged in early 2009 when Asian-American leaders protested UC's new policy to expand the pool of students considered for admission. While likely to increase black and Latino enrollment, the new rules are projected to result in significantly reduced admission of Asian Americans.

... The challenge of serving large numbers of students who aren't college-ready is one that has only belatedly become a priority for the state's community colleges.

Over the same period, Cal State has sought to reduce the need for remediation by various means, including requiring students to take remedial courses as soon as they enroll and by adapting an 11th-grade standards test to provide early information to students about their readiness for college-level work. Though the assessment program has been considered a model K-16 policy by organizations such as Achieve, the results of the entire remediation effort have been modest to date, hardly approaching the original 1996 goal of eliminating remediation. "We have made progress in the math skills, but not in the English," said Reed. "The single biggest challenge in California education is to get people to be able to read with comprehension."

Though it may be one of the state's greatest challenges, the challenge of serving large numbers of students who aren't college-ready is one that has only belatedly become a priority for the state's community colleges. More than 70 percent of community college students who take a placement exam are assessed as performing below college level—the combined result of poor K-12 preparation and delays in college attendance. Of those who take remedial courses in English, only 41 percent attempt a transfer-level class within three years. Even fewer—just 14 percent—do so in math.

Under a new strategic plan, the community college system has heightened attention to remediation. The success of the new "Basic

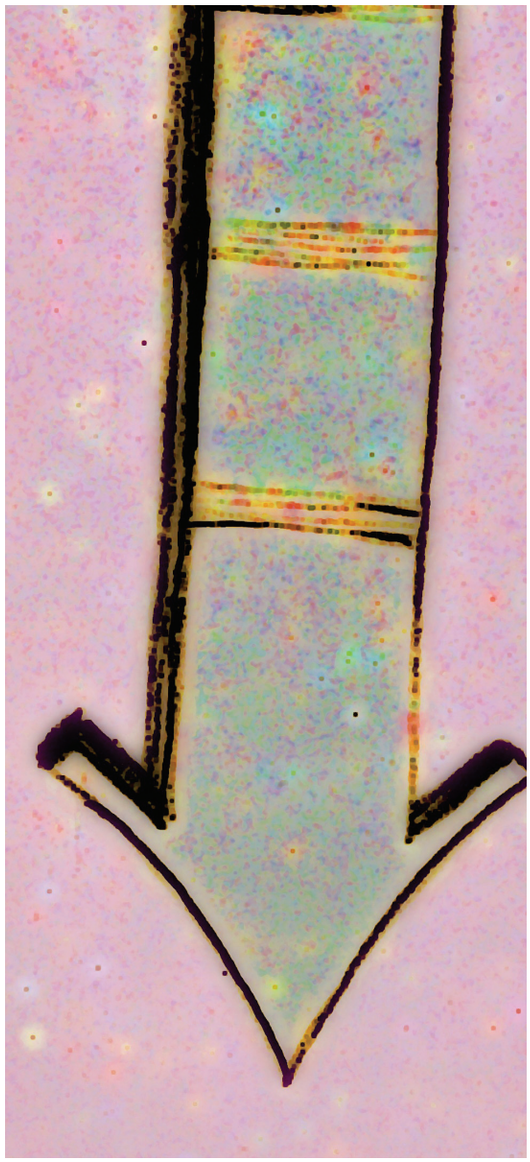
If higher education's troubles in California have their own contours, they are also symptomatic of the outmoded structures that have hobbledpolicymaking generally in the state. By May, voters' rejection of a seriesof ballot measures opened up a $24 billion deficit, laid bare the state'spolicy paralysis, and brought California to the brink of disaster.

As Governor Arnold Schwarzenegger and legislative analysts released proposals for closing the gap, just about everything was on the table: Poor children could lose health insurance, hundreds of state parks could be closed, thousands of prisoners could be released, the K-12 school year could be seven days shorter, and the state welfare-to-work program could be shuttered. State employees, after sacrificing 9 percent of their salary through furloughs, were slated to lose another 5 percent of their take-home pay.

For higher education, the crisis is likely to continue squeezing out enrollment just when more students are seeking to attend school. In addition, Schwarzenegger threatened to eliminate the state's need-based financial aid program and end state subsidies to professional schools. Legislative analysts also recommended a fee increase for the community colleges and an additional 5 percent hike for the universities. Other proposals included increasing class sizes, increasing teaching loads, and eliminating athletics programs.

Any of the proposed cuts could further erode the ability of higher education in California to reach goals like ensuring access, maintaining affordability, and increasing completion rates. Taken together, the cuts could be devastating. But the cash-flow crisis has all but eliminated the notion of sacred cows. It has also made clear that even if the fiscal situation improves in a few years, California isn't likely to solve its higher education challenges until and unless it charts a course out of the political stalemates and management failures that led to its current dilemma.

Skills Initiative" is far from guaranteed, but failure is not an option if the state is to remain competitive. Unlike Cal State, the community colleges unfortunately have not yet announced clear targets for improved outcomes. Because of their federated structure, with much authority resting within 72 independent boards of trustees, reforms in the community college system tend to move slowly and lack statewide coherence.



New Leadership

In the last several years, a set of organizations—including the Campaign for College Opportunity and the California EDGE (Education, Diversity, and Growth in the Economy)—have brought new attention to the educational needs of the state. So have a series of reports by the Public Policy Institute of California. But it is far too early to know whether that awareness will be robust enough to translate into a coherent set of policies.

If it does, it may depend on the ability of the new leaders of UC and the CCC to move beyond or transcend the limitations of the Master Plan. Mark Yudof of the University of Texas, the first outsider to run UC in more than a century, was charged with trimming the bureaucratic bloat that was threatening to undermine the system's overall effectiveness. Yudof's experience and mindset were considered right for the job, even though his compensation package of more than $800,000 (nearly double his predecessor's) was raising the very same eyebrows as the university's previous questionable executive pay practices did.

The CCC vacancy was harder to fill, given that bureaucratic starvation at the chancellor's office made the job less appealing than many campus and district positions. The small staff, small salary, and lack of authority were widely understood to have sped Drummond's return to Los Angeles. The historically weak central office is at once a product of the system's belief in local autonomy and a sign of the low priority assigned the community colleges and their students. The colleges' success in recruiting Scott—a former college president who had just completed his term as chair of the Senate Education Committee—and the increasing awareness of the colleges' importance may help bring about a re-evaluation of that position.

The current presence of strong policy-minded leaders at the helm of all three institutions has raised the possibility of a serious higher education policy agenda. Both Reed at Cal State and Yudof in Texas led their institutions to participate in a voluntary accountability system, and Scott had spent several years shepherding accountability legislation. But whether the three will attempt to re-write the rules of the game, not to mention succeed at the task, is far from clear.

In spite of the state's budget challenges, early 2009 brought a few signs of movement. An effort to align college-readiness expectations across the systems got underway: the three systems joined with K-12 in the American Diploma Project, and the community colleges signed on to CSU's college-readiness test for 11th graders. A three-way agreement was also reached about the need to boost community college transfer, and a "Yudof Education Imperative" focused on improving the education pipeline. Observers who have watched such initiatives come and go to little effect wondered whether this time, as the Master Plan's 50th anniversary approached, something would be different. Legislators remained suspicious of higher education's motives—particularly those of the UC system, which was still recovering from the executive compensation scandal. A measure to revoke UC's constitutional autonomy was introduced by a bipartisan group of legislators in both houses. With that backdrop of deep mistrust and a fiscal predicament that threatened to consumer the entire policy agenda, some observers were skeptical that any positive movement was possible.

Early in the year, before voters rejected measures that would have held a budget deal together, CSU's Reed was more optimistic. Inspired by President Obama's goal of having the best-educated workforce in the world, Reed set a goal of increasing CSU graduates from 92,000 a year to 150,000 by 2020.

"People are just beginning to wake up," he said. "The general public, policymakers, legislators—everybody—has realized in the last couple of years that if California is going to reclaim its spot as the sixth or seventh largest economy in the world, if Californians are going to have a quality of life, it will take a major increase in the number of college graduates. It will depend on what I call a new workforce. This workforce is coming from a pipeline that is filled with students of color. California's economic future, its cultural and community future, is tied to how well-educated its citizens are going to be. California needs to once again serve as a national model-this time in partnering with our schools to help students of color prepare for postsecondary education and attain college degrees.

"Can California continue to reinvent itself every decade or so?" Reed asked. "Higher education has always played a role in every decade that that has happened." As a worsening fiscal environment imperils all of education in California, it is a story that the rest of the nation will want to follow. After all, the saying has it, as California goes, so goes the nation. C

CALIFORNIA HIGHER EDUCATION, THE MASTER PLAN, AND THE EROSION OF COLLEGE OPPORTUNITY

By Patrick M. Callan

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The National Center for Public Policy and Higher Education

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Introduction

California higher education was one of America's great public policy and educational success stories in the second half of the 20th Century. The post–World War II era introduced several decades of robust population expansion, and California led the nation—and indeed the world—as it achieved almost phenomenal growth of college opportunity. Sharp increases in student enrollments and campuses were paralleled by the rising quality and reputation of the state's public and private colleges and universities, of its advanced research, and of higher education's support of a vibrant state economy.

California's private colleges and universities have made vital contributions to the state throughout its history and they continue to do so. The principal story of the postwar era, however, derives from the growth of the nation's largest array of public colleges and universities of all kinds—research universities, regional state colleges and universities, and community colleges. This expansion reflected national trends at the time, but California was unique in its commitment to access and in the influence and continuity of a core public policy framework that was articulated in the 1960 California *Master Plan for Higher Education*.[1] The Master Plan's early successes in expanding college access created momentum that was sustained for decades. Yet despite the remarkable durability of this venerable framework, the Master Plan's relevance and utility have become problematic as California confronts the impact of educational, economic, and demographic change.

Two convergent themes are central to the modern history of California higher education: the public policy framework that enabled and supported broad college opportunity for most of the post–World War II era; and the expansion of access through a massive and diverse array of colleges and universities. In the following pages, I will describe these themes and then turn to three changing conditions facing higher education that have emerged over the past three decades:

1. Unstable, constrained public finance combined with political volatility;
2. Demographic shifts; and
3. A decline in the effectiveness of public schooling.

A concluding section draws these themes and conditions together while presenting several challenges confronting California in the first decade of this century.

The Struggle for Policy-Driven Growth

In virtually all states, veterans benefiting from the G.I. Bill after World War II created public pressure to expand the enrollment capacity of colleges and universities.[2] This pressure intensified in California in the late 1950s as population growth accelerated, and the first "tidal wave" of Baby Boomers approached college age. In 1960, the state responded by creating a 15-year Master Plan for Higher Education. That plan, the values and policies it reflected, and the growth that it envisioned are the context for the questions and challenges that confront California higher education almost 50 years later.

During the three decades after World War II, California did not differ from most other large states in seeking to plan and support enrollment growth of higher education. In fact, these issues became the dominant public policy themes for higher education in this era. California distinguished itself, however, through its path-breaking commitment to higher education opportunity, through the size and scale of its higher education systems, and through its development of the Master Plan, the state's comprehensive policy framework to expand capacity and manage growth.

Whether California higher education would expand was never at issue during this period. What was perceived as problematic, however, was the extent to which conflicts among local, institutional, and political interests would impede realization of an overarching policy goal: universal educational opportunity through planned and coordinated growth. Efforts to address these conflicts trace back at least to the Depression era. In 1932, a legislatively commissioned study conducted by the Carnegie Foundation for the Advancement of Teaching found that problems of policy and organization in higher education had resulted in overlapping functions, waste, and inefficiency; lack of unified policy; and inequitable distribution of state funds. In addition, the study found:

> There is a lack of articulation among the various units of the educational system. This has resulted in vigorous controversies over admission requirements, transfer regulations, and curricula. These controversies are aggravated by regional rivalries and local ambitions.[3]

The problems identified by the Carnegie report persisted despite the Legislature's creation of an advisory and ineffectual State Council for Educational Planning and Coordination. In 1945, a joint committee called the Liaison Committee was formed by the state Board of Education (which at that time had statewide jurisdiction over the junior

colleges and state colleges) and by the University of California (the University). The Liaison Committee was a voluntary effort to manage campus growth and program expansion and to deter legislatively imposed coordination. The principal policy vehicles of the Liaison Committee were *ad hoc* studies commissioned by it and the Legislature, studies that addressed such issues as: the degree-granting authority of junior colleges, state colleges, and the University; admissions standards; the needs and locations for new campuses; and the necessity and requisites of a state scholarship program.[4]

In the absence of an overarching policy framework, the Legislature could implement, ignore, or even augment the smorgasbord of recommendations presented by these studies—and it did all of these. For example, at the urging principally of the Santa Barbara Chamber of Commerce and despite initial opposition by the University, the state college at Santa Barbara was transferred to the University in 1943. (In 1946, a state ballot proposition prohibiting such transfers in the future was enacted.) New state college campuses were authorized in 1946 at Los Angeles and Sacramento, in 1948 at Long Beach, and in the late 1950s at Fullerton, Hayward, Northridge, and Stanislaus County. The University of California added medical and engineering schools at its Los Angeles campus and colleges of letters and sciences at its Davis and Riverside campuses. In 1955, the Legislature established the first state scholarship program.

By the late 1950s, the lack of what the Carnegie report had termed "unified policy" had created a planning vacuum in which initiatives and aspirations for growth and change were scattered widely across communities and institutions, and ultimately were controlled by the Legislature and the governor. The "problems of policy and organization" found in the 1932 report had not only persisted but had been exacerbated by the G.I. Bill, the increase in birth rates after World War II, and in-migration. In the 1957 legislative session, the scramble for new campuses intensified: bills authorizing 17 new state colleges were considered and 4 were approved; none of the 4 had been on the list of priorities recommended in the Liaison Committee's 1957 planning report. Several were placed in sparsely populated areas represented by powerful state legislators.

Academics and politicians alike recognized that reform was needed to bring order to the chaos and uncertainty. Clark Kerr, who had assumed the presidency of the University of California in 1957, took the initiative. In 1959, Assemblywoman Dorothy Donohue, at his encouragement, introduced a resolution calling on the Liaison Committee to prepare a master plan for higher education and to present it to the Legislature at the beginning of the 1960 session. It also called for a two-year moratorium on legislation affecting higher education. The resolution was adopted by both the Assembly and the Senate.

The major concerns of the educational leaders who initiated and then wrote the Master Plan were immediate ones. In his memoir of this period, Clark Kerr reflected that:

> The plan looked to us who participated in its development more like a desperate attempt to prepare for a tidal wave of students, to escape state legislative domination, and to contain escalating warfare among its separate segments. . . . And the preparation, the escape and the containment in each case was barely on time and barely succeeded. The Master Plan was a product of stark necessity, of political calculations, and of pragmatic transactions.[5]

Eight months after the adoption of the resolution, a proposed Master Plan was presented to the Legislature, and its major provisions were enacted into statute. It became the state policy structure that resolved the immediate challenges to higher education. Reaffirmed many times, the Master Plan remained in place long after the emergency described by Kerr had passed. Each sector of California higher education gained immediate benefits:

- The junior colleges (subsequently designated "community colleges") gained acceptance as an integral part of higher education, and were given the largest mandate for expansion.
- The state colleges, which ultimately became the California State University (the State University), were removed from the public school system and were given degree-granting authority through the master's level as well as an independent governing board.
- The organization of the University of California was not affected, but its monopoly on state-funded, advanced graduate and professional programs and research was confirmed.
- The Legislature was relieved of the increasingly controversial political pressures for new campuses by delegating initial approval of these decisions to a new coordinating council.

Rarely do all parties to a negotiated plan achieve not only their own individual goals, but, in so doing, benefit the overarching public interest—as reflected in this case in greater college opportunity and controlled institutional competition. The Master Plan framers were able to accomplish this feat because they advanced institutional aspirations in the context of a common policy goal: the commitment that every California high school graduate who was able to benefit from college could attend a college or university. California became the first state or, indeed, governmental entity to establish this principle of universal access as public policy.[6] It was this principle that made the Master Plan a major innovation in social as well as educational policy. Its specific provisions

established an organizational and policy framework for meeting the state's commitment to access and for balancing what Kerr later characterized as the egalitarian and meritocratic imperatives.[7]

The organizational provisions of the Master Plan were straightforward. College opportunity would be provided by grouping public colleges into three statewide "systems" organized according to their missions, each with designated enrollment pools. The junior colleges would offer instruction up to the 14th grade level and would include courses for transfer to baccalaureate-granting institutions as well as vocational and technical programs. These colleges would be open to all Californians who were capable of benefiting from attendance. The state colleges, now the California State University, would offer undergraduate education and graduate programs through the master's degree and could participate in joint doctoral degree programs with the University of California. Students were to be admitted from the top third of high school graduates. The University was to draw its students from the top eighth of California high school graduates. Within public higher education, the University was to have sole authority to offer doctoral degrees (except for joint doctoral programs offered with the state colleges), as well as professional degrees in medicine, law, dentistry, and veterinary medicine. The University was also designated the state's primary agency for state-supported academic research. Selective admissions at the state colleges and the University restricted the growth of four-year institutions, and this meant that most students would enroll, at least initially, in junior colleges. Californians who enrolled in junior colleges for academic or financial reasons could qualify for transfer to a state college or University campus after two years, and all qualified students were to be accepted. These provisions for transfer, along with the promise of college access to all who could benefit from it, connected and balanced the egalitarian and meritocratic dimensions of the plan.

The Master Plan recommended and the Legislature established a governing board for state colleges, separating those institutions from the State Board of Education. To replace the Liaison Committee, a state board to coordinate higher education was created by statute. This new board was made up of representatives of the public systems of higher education and the private nonprofit colleges and universities. The Legislature expressed in statute its intention to establish new campuses only upon recommendation from this board. The state scholarship program for eligible undergraduates in public and private institutions was expanded. This program served the dual function of providing students with the option of attending private colleges and universities and enabling the private institutions to absorb a portion of the projected enrollment growth. Public higher education was to be low-priced, and California residents were not to be charged tuition, reflecting the state's commitment to access.

The Master Plan pioneered the concept of universal access to education and training beyond high school. It was also unique in establishing mission differentiation as the basis of organization and governance for all of the state's public colleges and universities, including the explicit delineation of eligibility criteria for admission to each of the three public systems. The plan sought to recognize, balance, and institutionalize the values of competitive excellence and egalitarianism, selectivity and open admissions, and growth and efficiency. Costs were controlled through constraints on the mission and enrollment of each of the three public sectors and through concentration of growth in the community colleges. In short, the plan constituted the policy and organizational framework for both the expansion of college opportunity and for the University's high national and international ranking.

Since the Master Plan's adoption in 1960, formal revisions to its framework have included: the creation of a statewide Board of Governors for community colleges in 1967; the transformation of the statewide coordinating board into the California Postsecondary Education Commission (CPEC) in 1973; the imposition of student charges (still not called "tuition") in all three public sectors; and the legislative authorization for the State University to offer its own doctoral degree, the Ed.D., in 2005.

Growth: Students, Campuses and Dollars

After World War II, California's dramatic growth and the state's response to its population increases provided the context and the impetus for higher education policy. In the early 1960s, California became the nation's most populous state with 17.5 million residents and by 2000 that number had nearly doubled. Expansion of higher education in California was inevitable because of the pressure of its rapidly growing population compounded by public demand for college access. As in other states, public demand for higher education rose to political saliency as local communities pressed their legislators for action. California responded to this pressure by increasing college enrollment at a rate that exceeded the state's rapid population growth (see table 1).

Table 1

Growth of Population and Public Higher Education Enrollment

Year	*California Population (thousands)*	*Population Growth*	*Total Growth in Public Higher Education Enrollment**
1960	15,727	49%**	67%**
1970	20,038	27%	300%
1980	23,780	19%	36%
1990	29,828	25%	12%
2000	34,099	14%	16%
2005	36,154	6%	14%

* Enrollment data are for fall full-time-equivalent students.

** Increases are for decade ending in 1960.

Note: Population and enrollment growth figures are for the previous decade, except for 2005 figures, which are compared with 2000.

Sources: Population data: U.S. Census Bureau, *Statistical Abstract*, "Bicentennial Edition: Historical Statistics of the United States, Colonial Times to 1970," and *Statistical Abstract* annual editions, http://www.census.gov/compendia/statab/past_years.html (accessed April 10, 2008); and data for 1970 to 2005 from California Department of Finance, Demographic Research Unit, *Race/Ethnic Population with Age and Sex Detail* (1970–1989, 1980–1999, and 2000–2005 editions), http://www.dof.ca.gov/html/demograp/data/DRUdatafiles.php (accessed March 28, 2008). Enrollment data: 1960 data from California Higher Education Policy Center, *Financing the California Master Plan: A Data Base of Public Finance for Higher Education in California 1958/59 to 1996/97* (San Jose, CA: 1997); and data for 1970 to 2005 from California Postsecondary Education Commission (CPEC), *Fiscal Profiles 2006*, Report 06-13 (Sacramento: 2006).

In purely quantitative terms, the transformations of higher education in the last half-century have been staggering, even after considering population growth. Total enrollment of undergraduate and graduate students in public and private nonprofit higher education increased from about 163,000 in 1950 to 250,000 in 1960, and to 1.8 million in 2005 (see table 2).[8] Public higher education accounted for most of this enrollment growth:

- Community colleges absorbed the greatest share of growth, from about 56,000 students enrolled in 1948 to 98,000 in 1960, to over 1.1 million in 2005.
- Enrollment in the State University grew from just under 23,000 in 1948 to 61,000 in 1960 and to more than 324,000 in 2005.
- The University enrolled about 43,000 students in 1948, some 44,000 in 1960, and over 201,000 in 2005.
- Private colleges and universities accounted for approximately 41,000 students in 1950, 47,000 in 1960, and 202,000 in 2005. Even with this substantial growth, however, the independent institutions' share of all California college enrollments dropped from about 25% in 1950 to about 11% in 2005.

Table 2

Enrollment in California Higher Education, 1948 to 2005

Year	*CCC*	*CSU*	*UC*	*Independent**	*Total*
1948	55,933	22,787	43,469	N/A	N/A
1950	56,624	25,369	39,492	41,036	162,521
1960	97,858	61,330	43,748	47,000	249,936
1970	526,584	186,749	98,508	N/A	N/A
1980	752,278	232,935	122,761	133,313	1,241,287
1990**	818,755	272,637	152,863	145,375	1,389,630
2000	999,652	279,403	165,900	173,341	1,618,296
2005	1,121,681	324,120	201,403	202,035	1,849,239

* "Independent" includes only those institutions that are members of the Association of Independent Colleges and Universities.

** Data for independent institutions are for 1991 rather than 1990.

Note: Enrollment data are for fall full-time-equivalent students.

N/A = Data are not available.

Sources: Data for 1948 and 1950 from California Department of Education, *A Master Plan for Higher Education in California: 1960–1975* (Sacramento: 1960); CCC, CSU and UC data for 1960 from California Higher Education Policy Center, *Financing the California Master Plan: A Data Base of Public Finance for Higher Education in California 1958/59 to 1996/97*, (San Jose, CA: June 1997); data for independent institutions for 1960 from the Association of Independent California Colleges and Universities, *1960 Guidebook*; and data for UC, CSU, and CCC from 1970 to 2005 and for independent institutions for 1980, 1991, 2000, and 2005 from CPEC, *Fiscal Profiles 2006*, Report 06-13 (Sacramento: 2006).

Public and private four-year baccalaureate-granting institutions enrolled two-thirds of California's college students in 1950 and 39% in 2005. In terms of numbers of students served, the community colleges became the predominant sector of California higher education, enrolling substantially more students than the other sectors combined. This distribution followed from public policy decisions concerning access, institutional mission, capacity, and student eligibility in the 1960 Master Plan.

The framers of the Master Plan encouraged access by prohibiting tuition for California residents at any public campus, but this provision, which eroded as the institutions increasingly levied "fees," was finally abandoned. Even though tuition remains relatively modest at the community colleges and the State University, college attendance is expensive in California because of the state's high cost of living.[9]

The initial state scholarship program was created in the mid-1950s primarily to enable academically high-achieving students to attend in-state private colleges and universities. As the public institutions raised tuition and fees, the original program was modified and grew into a constellation of Cal Grant programs. In 2006, these grants were awarded to about 277,000 students at a cost of over one billion dollars (see table 3). In addition, each of the public systems of higher education administers its own financial aid programs. In the University and the State University, set-asides from student fees are the principal source of support for these programs.

Table 3

Cal Grant Awards, 2006

Institution	***Total Number of Awards***	***Total Award Amount*** *(in millions)**
UC	49,655	$308
CSU	67,952	$216
CCC	114,163	$162
Independent	27,239	$249
Private Career Colleges/Other	17,624	$166
Total	**276,633**	**$1,100**

* Total award amounts represent total value of awards offered, not reconciled payments. The total does not match sum of column due to rounding.

Source: California Student Aid Commission, *Preliminary Grant Statistics Report 2006*, provided by the commission through email communication.

Increases in college participation in California were made possible by massive increases in capacity as existing campuses were expanded and new campuses were built (see table 4). The number of California Community College campuses, where the largest

growth was concentrated, increased from 43 in 1945, to 64 in 1960, and to 108 in 2005; the State University added 14 campuses from 1945 to 2005, for a total of 23; and the University had ten campuses by 2005. Including all three systems, the number of public college and university campuses totaled 141 in 2005.

Table 4

Number of Campuses by Sector, 1945 to 2005

Year	*CCC*	*CSU*	*UC*	*Independent**
1945	43	9	2	69
1950	55	12	2	74
1960	64	16	6	78
1970	92	20	9	100
1980	105	20	9	115
1990	106	21	9	120
2000	107	22	9	126
2005	108	23	10	N/A

* "Independent" includes only those nonpublic colleges and universities accredited by the Western Association of Schools and Colleges (WASC).

N/A = Data are not available.

Sources: California Postsecondary Education Commission, *California Colleges Mailing List*, http://www.cpec.ca.gov/OnLineData/AddressOptions.asp (accessed March 10, 2008); and UC History Digital Archives, http://sunsite.berkeley.edu/uchistory/general_history/overview/maintimeline.html (accessed March 11, 2008).

The 15 years from 1945 through 1960 reflect the uncoordinated building of new campuses that led to the enactment of the Master Plan. In the 1960s and 1970s, growth followed the Master Plan's guidelines: New community colleges brought higher education within commuting distance of students; and for the four-year systems, new campuses recommended in the plan were built. As described in the next section, however, institutional and community pressures in the 1990s began to replace planning based on demographics and projected regional needs, as decision-making about the placement of new campuses reverted to the politicized approach that had dominated the decades prior to the Master Plan.

The spectacular growth of California higher education cannot be explained simply by population increases or market forces. Rather, the growth of colleges and universities in the state is directly attributable to public policies and state financial support of those policies over more than half a century. The operating revenues from state and local sources for public higher education from 1960 through 2005 are summarized in table 5.

Table 5

State and Local Operating Support for Public Higher Education, 1960 to 2005 (in millions)

Year	*CCC*	*CSU*	*UC*	*Total*
1960	$ 58	$ 55	$ 99	$ 169
1970	$ 366	$ 285	$ 330	$ 741
1980	$ 1,276	$ 814	$ 902	$ 2,749
1990	$ 2,489	$ 1,632	$ 2,077	$ 5,498
2000	$ 3,986	$ 2,175	$ 2,716	$ 7,293
2005	$ 4,806	$ 2,476	$ 2,699	$ 8,225

Inflation-Adjusted State and Local Operating Support for Public Higher Education, 1960 to 2005 (in millions)

Year	*CCC*	*CSU*	*UC*	*Total*
1960	$ 384	$ 363	$ 653	$ 1,115
1970	$ 1,843	$ 1,435	$ 1,661	$ 3,730
1980	$ 3,025	$ 1,929	$ 2,138	$ 6,513
1990	$ 3,719	$ 2,439	$ 3,104	$ 8,217
2000	$ 4,520	$ 2,467	$ 3,080	$ 8,271
2005	$ 4,806	$ 2,476	$ 2,699	$ 8,225

Notes: CCC data are for State General Fund and Local Property Taxes. CSU and UC data are for State General Fund. Inflation adjustments are based on U.S. Bureau of Labor Statistics, and are in 2005 dollars.

Sources: Data for 1960 to 1990 from California Higher Education Policy Center, *Financing the California Master Plan: A Data Base of Public Finance for Higher Education in California 1958/59 to 1996/97* (San Jose, CA: 1997); and data for 2000 and 2005 from California Department of Finance, *Governor's Proposed Budget* (Sacramento: 2002 and 2007 editions).

Altered State Realities: Constrained Public Finance and Political Volatility; Demographic Shifts; and the Public Schools

The Master Plan for Higher Education was developed to meet the challenges that California faced in the second half of the 20th Century. In the 21st Century, California and its colleges and universities must adapt to new economic, political, demographic, and educational changes that have reshaped the state and its public sector. This section identifies and explores these altered state realities.

UNSTABLE, CONSTRAINED PUBLIC FINANCE COMBINED WITH POLITICAL VOLATILITY

The 1960 Master Plan was the product of the optimism of the post-World War II era, an era characterized by massive expansion of public services to meet the needs of a growing population. In addition to its support of higher education, California made and implemented major commitments to public schools, highways, parks, and extensive water and irrigation projects. This expansion took off in the mid-1940s and early 1950s under the gubernatorial administrations of Earl Warren and Goodwin Knight, peaked during the administration of Edmund G. Brown from 1958 to 1966, and was sustained under his successor, Ronald Reagan.

In 1978, however, the California electorate brought an abrupt end to the era of public sector expansiveness by overwhelmingly adopting Proposition 13, an initiative that reduced property taxes by about 60% and severely constrained future tax increases. In addition to inaugurating an era of reduced public spending, Proposition 13 ushered in an era of "government by plebiscite," in which the initiative, sparsely used prior to 1978, was increasingly commandeered to "legislate" on a broad spectrum of issues. Such issues included but were not limited to: minimum spending on public schools (1988), legislative term limits (1990), mandated prison terms (1994), affirmative action (1996), and Native American casinos (1998). One effect of the extensive use of initiatives has been directly or indirectly to mandate specific expenditures, even as Proposition 13 and other tax-cutting measures constrained revenue growth. The consequence has been a reduction of the discretionary funds available for appropriation—that is, funds that support higher education and other expenditures that are not legal mandates or entitlements.[10]

Higher education has not escaped the harsh realities of the diminished public sector in the 30 years since 1978. Another effect of Proposition 13 has been the state's increasing dependence on income, capital gains, and sales taxes—the revenue streams most sensitive to economic conditions. As a result, during periods of recession and state revenue shortfall, higher education has faced harsh fiscal restraints. On the other hand, the economic dynamism of California has also enabled several years of generous state support when the economy has been flourishing. It was fortuitous that Proposition 13 and the reversal of public sector fortunes did not begin until after the Baby Boomer college enrollments had peaked and after most of the new campuses and campus expansions envisioned by the 1960 Master Plan were completed or well underway.

The most significant, and apparently permanent, departure from the Master Plan has been the abrogation of its foundational public policy commitment to college opportunity—that is, its commitment to make higher education available for every Californian who can benefit from college. This historic obligation undergirded the differentiated missions and admissions policies of the three public sectors. There has never been a formal retraction or revision of the commitment, and it continues to enjoy the rhetorical support of most political and higher education leaders. But it is a promise that the state honors only in the best of economic times, and subtly sacrifices in years of budget problems. Between 1960 and 1980, the Master Plan commitment to access was California's most fundamental public policy. But since the 1980s, this commitment has eroded steadily, often without public discussion or deliberation.

Recessions bring state financial stringency and in California they have brought severe restrictions in college access, principally at the broad-access institutions—the community colleges and the State University:

- Community college enrollments were reduced by more than 250,000 students in the recession of the early 1980s.
- In the recession of the early 1990s, enrollments decreased by over 170,000 in the community colleges and 50,000 in the State University.
- The recession early in the current decade brought enrollment reductions of nearly 150,000 in the community colleges.[11]

What is particularly noteworthy in the context of the Master Plan's commitment to college opportunity is that the broad-access institutions—the State University and the community colleges—have been the locus of enrollment reductions. In each recession, the community colleges have responded to state budget cuts with reductions in faculty, courses, and class sections, and tuition has been increased.

The broad-access institutions of California higher education, particularly the community colleges, enroll most of the low-income, first-generation, and Latino college students. Many of these students work and support families, attend part-time, and depend on evening and weekend classes. Scheduling changes and the elimination or reduction of part-time faculty, courses, and class sections reduce capacity, and this reduced capacity, along with tuition increases, results in lower enrollments. This subtle form of rationing of higher education opportunity has occurred without formal changes in policy or state priorities. Despite the Master Plan's commitment to access, the suppression of enrollments at the broad-access institutions for over three decades is *de facto* state policy in difficult budgetary times.

An analysis of the impact of the 2004–2005 community college budget reductions and enrollment losses by the Institute for Higher Education Leadership and Policy observed that:

> The greatest impact has been felt by the less well-prepared students who are not as savvy to deadlines, fees, financial aid, and ways to navigate the system. . . . Many of the colleges we studied primarily serve first-generation students who have limited understanding of the educational system. Students who are somewhat uncertain about attending in the first place or about their ability to succeed are those most likely to be discouraged by the reduced access to classes and services, according to campus officials. Some respondents were very concerned that this will shut down the pipeline to the diverse clientele that the community colleges aim to serve.[12]

After enrollments in broad-access institutions are reduced, the enrollments do not recover immediately when economic conditions and state appropriations improve, instructional capacity is restored, or even when tuition is frozen and financial aid is increased. These experiences from the 1990s are illustrative:

- The State University experienced budget cuts and raised tuition substantially in 1991, 1992, and 1993. Student fees increased by 103% during this period. Enrollments decreased each year from 1992 and 1995 and did not recover to the 1990 level until 2001, even though state funding was fully restored (and more) by 1997 and a multi-year tuition freeze was instituted.
- At the community colleges, state and local funding was cut in 1993 and 1994 and was restored to its pre-recession level in 1996. But enrollments were depressed for the remainder of the decade; they reached and surpassed the 1991 level in 2000.[13]

It is reasonable to conclude that the college aspirations of students or potential students may have been dampened when they were confronted with precipitous fee increases or

denied access to college courses or services such as counseling and child care.

The state's failure to plan for predictable enrollment growth has been at least as problematic as its response to financial downturns. By the early 1990s, it was widely expected that the numbers of high school graduates in California would increase substantially during the first decade of the 21st Century. Projections in 1995, based on the continuation of established trends, set the impact on college enrollments at an additional 450,000 students by 2005.[14] In the late 1950s, it had been these types of projections that had evoked the planning and policy response embodied in the Master Plan. In contrast to the foresight of that era's leaders, however, California did not develop a state plan to accommodate its growing numbers of high school graduates. Political pressure for such a plan was lacking, the influential Legislative Analyst's Office argued for an incremental rather than a comprehensive approach, and no higher education leader stepped forward to press the case for planning, as Clark Kerr had done in 1959. In 1994, Kerr, by then in his eighties, urged that the state adopt a comprehensive approach, arguing that "the course of facing-the-future-all-at-once" in 1960 had helped California create the best system of higher education in the nation in terms of both access and quality.[15]

Compounding the failure to plan, state and higher education leaders regressed, in effect, to the practices of the 1950s that the Master Plan was designed to remedy. In the 1990s, each sector, with the support of communities, local boosters, and their legislators, put forward its own aspirations for new campuses. Policy leaders gave in to local and regional political pressures and ignored demographics in the placement of new institutions. New campuses were established by the University at Merced and by the State University at Monterey, both in sparsely populated locations and far from the areas where projected growth of high school graduates was concentrated. For the first time since the enactment of the Master Plan, pork-barrel politics dominated decision-making processes for campus placement. California's capacity for comprehensive higher education planning was nonexistent and the vacuum created by the absence of a statewide plan helped open the door for the politicized approach to increasing higher education capacity.

It is impossible to ascertain precisely the importance of the Master Plan in the successful expansion of California higher education in the 1960s and 1970s. Assuredly, a robust economy, along with dedicated state and higher education leaders, contributed to the success. By the same token, it is impossible to pinpoint the effect of the lack of statewide planning on recent history. However, by 2006 the community colleges—the point of college access for most Californians—enrolled 120,000 fewer students than had been projected in the mid-1990s.[16] In addition, smaller proportions of high school graduates were enrolling in college, and the likelihood that a California high school student would enroll in college by age 19 was 35%, compared to 53% in the leading states on this measure.[17]

DEMOGRAPHIC SHIFTS

The rate of growth and the sheer size of California's population is only half of the demographic story. The other half is the transformation of an overwhelmingly white populace—over 90% at the time of the Master Plan's adoption—to a "majority minority" state in which no population group constitutes a majority (see table 6). By 2000, about 47% of Californians were white; 33% were Hispanic; 11% were Asian/Pacific Islander; and 7% were black. In contrast to the first 25 years after World War II when the state's growth was fueled primarily by westward in-migration of Americans from other states, the immigrants of the past four decades have been overwhelmingly Asian/Pacific Islander and Hispanic. More than one in four of the 34 million Californians in 2000 were foreign born.

Table 6

California Population by Ethnic Group, 1960 to 2004

Year	*White*	*Hispanic*	*Asian/Pacific Islander*	*Black*	*American Indian*	*Total Population*
1960	14,465,000	N/A	N/A	884,000	N/A	15,727,000
1970	15,480,723	2,423,085	671,077	1,379,563	83,838	20,038,286
1980	15,949,865	4,615,231	1,257,019	1,793,663	164,290	23,780,068
1990	17,023,502	7,760,598	2,748,810	2,106,060	189,503	29,828,473
2000	16,098,880	11,085,437	3,872,800	2,220,712	184,754	34,098,744
2004	16,287,111	12,707,737	4,374,758	2,193,043	213,316	36,505,743

Percent of Total Population, 1960 to 2004

Year	*White*	*Hispanic*	*Asian/Pacific Islander*	*Black*	*American Indian*	*Total Population*
1960	92%	N/A	N/A	6%	N/A	100%
1970	77%	12%	3%	7%	0.4%	100%
1980	67%	19%	5%	8%	0.7%	100%
1990	57%	26%	9%	7%	0.6%	100%
2000	47%	33%	11%	7%	0.5%	100%
2004	45%	35%	12%	6%	0.6%	100%

N/A = Data are not available.

Notes: The total for 1960 includes those who selected "other" and totals for 2000 and 2004 include individuals who selected multiple races. The Hispanic category for 1970 to 1990 equals a sum of Hispanic white, Hispanic Asian/Pacific Islander, Hispanic black, and Hispanic American Indian. Ethnic categories are identified as per source materials.

Sources: Data for 1960 from U.S. Bureau of the Census, *Statistical Abstract*, "Bicentennial Edition: Historical Statistics of the United States, Colonial Times to 1970," http://www.census.gov/compendia/statab/past_years.html (accessed April 10, 2008); and data for 1970 to 2004 from California Department of Finance, Demographic Research Unit, *Race/Ethnic Population with Age and Sex Detail* (1970–1989, 1980–1999, and 2000–2004 editions), http://www.dof.ca.gov/html/demograp/Data/DRUdatafiles.php (accessed March 28, 2008).

Not surprisingly, these demographic shifts are more pronounced in the state's young population (see table 7). Whites accounted for 40% of California's high school graduating class of 2005, followed closely by Hispanics/Latinos at 37%, with Asians, Filipinos, and Pacific Islanders at 14%, and African Americans accounting for 8%. Public school enrollment reflects the depth and permanence of this profound transformation.

Table 7

Distribution of California Public School Enrollment and Graduates by Ethnicity, 2005

Year	*White (not Hispanic)*	*Hispanic or Latino*	*Asian/Filipino/ Pacific Islander*	*African American*	*American Indian/ Alaska Native*
Kindergarten	28%	51%	10%	7%	0.7%
Grade 1	28%	51%	10%	7%	0.8%
Grade 2	28%	51%	11%	7%	0.8%
Grade 3	29%	50%	11%	8%	0.8%
Grade 4	30%	49%	11%	8%	0.8%
Grade 5	30%	49%	11%	8%	0.8%
Grade 6	31%	48%	11%	8%	0.8%
Grade 7	32%	46%	11%	8%	0.8%
Grade 8	33%	45%	11%	8%	0.8%
Grade 9	33%	45%	11%	9%	0.9%
Grade 10	35%	42%	12%	9%	0.9%
Grade 11	36%	40%	13%	8%	0.9%
Grade 12	38%	38%	13%	8%	0.9%
TOTAL	**31%**	**47%**	**11%**	**8%**	**0.8%**
High School Graduates	**40%**	**37%**	**14%**	**8%**	**0.8%**

Notes: The rows of percentages do not add to 100 because individuals who selected multiple ethnic groups or none at all are not reflected. Students who are not associated with a specific grade are also not included. Ethnic categories are identified as per source materials.

Sources: K–12 data from California Department of Education, DataQuest, *Enrollment by Gender, Grade and Ethnic Designation*, http://dq.cde.ca.gov/dataquest/ (accessed March 24, 2008) and fax communication from the California Department of Education on March 25, 2008. Data for graduates from California Department of Education, Ed-Data, *Accountability (API, AYP/High Schools), 2004–05*, www.ed-data.k12.ca.us (accessed March 25, 2008).

In short, California's higher education pipeline in the early 21st Century bears little resemblance to the homogeneous, preponderantly white Baby Boomer generation of the 1960s and 1970s. Many of the "new Californians"—Chinese and Japanese Americans in particular—enroll in California's most selective colleges and universities (see table 8). Many others, however, are hampered by barriers of poverty, language, weak public schools, and poor high school completion rates, and the adverse impacts of these barriers

are reflected in tables 7 and 8. The low high school graduation rates and college enrollment rates of Latinos, even as they approach majority status in the public schools, illustrate that impact.

Table 8

Distribution of Higher Education Enrollment by Ethnicity, 2005

	White	*Latino*	*Asian/ Pacific Islander*	*Filipino*	*Black*	*Native American*	*Other*	*NonRes Alien*	*No Response*
UC	37%	12%	29%	4%	3%	0.6%	2%	5%	7%
CSU	37%	22%	13%	4%	6%	0.7%	3%	4%	10%
CCC	37%	28%	12%	4%	8%	0.9%	2%	1%	8%
Independent	49%	13%	13%	0%	6%	0.7%	0%	7%	11%

Notes: "Independent" includes only those nonpublic colleges and universities accredited by WASC. "NonRes Alien" stands for nonresident aliens. Ethnic categories are identified as per source materials.

Source: CPEC, *Quick Data, Data by Ethnicity*, http://www.cpec.ca.gov/OnLineData/Characteristics.asp (accessed April 2, 2008).

PUBLIC SCHOOLS

The effectiveness of California's public schools was not an issue for the framers of the Master Plan. The limited indicators available in 1960 offered no reason for fundamental concerns about the health of public education. For example, the state's public schools, though not without their critics, consistently ranked high among the leading ten states and above the national average in expenditures per pupil; and its school teachers ranked among the best educated in the nation. At the time, it was reasonable to assume that graduates of California high schools would be able to benefit from the college opportunities that implementation of the Master Plan would create, and its architects made that assumption.

In 1978, the burden of Proposition 13 fell particularly heavily on public schools. Combined with legislative implementation of a court-mandated equalization of district funding, the passage of Proposition 13 set school finance into a downward spiral, one that was marked with only brief spurts of recovery in peak state revenue years. In 2006, California's spending per pupil was $167 below the national average and well below that of major industrial states ($4,478 below New York, $4,067 below Massachusetts, $2,181 below Pennsylvania, and $842 below Michigan). California ranked next to last among states in class size, and 50th in the ratio of guidance counselors and librarians to students. These declines occurred at the same time that the schools needed more resources to

address increasing ethnic and language diversity and the poverty that afflicted almost one in five of California's children.[18]

Beginning in the 1990s, the National Assessment of Educational Progress has assessed the performance of fourth and eighth grade students in math, reading, and science by state. In 2005, 22% of California's eighth graders scored at levels of proficient or above in math, compared with 38% in the best-performing states; low-income California eighth graders scored very poorly in reading (21% were proficient compared to 38% in leading states); and in science, 18% were proficient compared with 41% in leading states. In science, the percentage of eighth graders scoring at or above the proficient level had decreased over the previous nine years, at one of the steepest rates in the nation. The poor performance of eighth graders suggests that they are not well prepared for challenging high school coursework in these basic disciplines. One consequence for higher education is that only 25% of high school graduates are academically prepared for college-level work.[19] In 2007, the University reported that more than 28% of its entering freshman, drawn from California's highest-achieving high school graduates, did not perform at the required level as measured by its analytic writing placement exam. Fifty-six percent of regularly admitted freshmen in the State University needed remediation in either English or mathematics, and 27% required remediation in both reading and math. Although statewide standards for college readiness or placement examinations are lacking, a survey by the community colleges indicates that approximately half of community college students require basic skills instruction.[20]

Conclusion

The 1960 Master Plan and the expansion of California higher education were not without flaws or critics. By real-world standards, however, they served Californians well in an era of rapid population growth.

First, the Master Plan was cost-effective in managing growth—including a 300% enrollment increase in the first decade after its passage. The Master Plan enabled the state to meet its commitments to college opportunity by efficient distribution of campuses and programs. Campuses were situated in population centers, and decisions as to where to locate new campuses were removed from the pork-barrel politics of earlier eras.

By resolving the issues of institutional mission and program allocation and by encouraging each sector, as the Master Plan legislation articulated, "to strive for excellence in its sphere," California developed a diverse array of colleges and universities to meet the needs of a growing population that had a broad range of abilities, motivations, and educational aspirations. By sparing the Legislature and public the battles over turf that dominated the higher education landscape in other states, the Master Plan contributed to public confidence, which in turn brought state financial support to higher education. The affirmation of the University of California's franchise in doctoral education and state-supported research positioned the University to maintain and enhance its standing among leading research universities.

The Master Plan and California's higher education system quickly achieved almost iconic status in California, but California now faces a very different set of challenges than in 1960. The performance of California education has declined substantially, and core provisions of the Master Plan have succumbed to political and budgetary pressures. Although citizens' commissions and special legislative committees in every decade since the 1960s have consistently reaffirmed the core provisions of the Master Plan, the letter and spirit of these provisions have been set aside when expedient. Reducing opportunity at the community colleges, and, at times, at the State University, has become a standard state response to financial difficulty. In contrast to the first decade of the Master Plan when enrollments exceeded expectations, the community colleges now enroll considerably fewer students than were projected by conservative forecasts less than a decade ago.

Despite these enrollment shortfalls, the community colleges have grown exponentially as their roles in serving local labor markets—and most Californians who aspire to a baccalaureate degree—have solidified. The community colleges enroll the overwhelming majority of college students in California. Relatively few students, however, actually benefit from the transfer opportunities within public higher education that were central to the Master Plan—less than 70,000 transferred in 2007 (13,923 to the University and 54,379 to the State University).[21] One consequence is that California consistently ranks in the bottom third among states in baccalaureate degree production.[22] In short, the egalitarian provisions of the Master Plan commitment—access and transfer—are in serious disrepair.

The diminished college opportunity that exists today in California casts a shadow on the state's economic future. A 2007 report from the Public Policy Institute of California warned that the state's workforce would likely fall far short of the level of education and skills needed in the future. The report's authors estimated that 39% of the jobs in the state's increasingly knowledge-based economy would require college degrees by 2020, but only 33% of working-age adults were projected to have acquired them by that time. The report warned that it is unlikely that the gap would be filled by in-migration of college-educated and trained workers because of California's high costs of living, particularly housing. The authors recommended higher rates of college participation and graduation among Californians.[23] A separate analysis projected a decline in the educational attainment of California's adult population and in personal income by 2020, "unless the state can increase the number of Hispanics/Latinos going to college and getting degrees."[24]

As the indicators of a growing educational deficit accumulate, the state's financial condition offers little prospect of sustained infusions of new public dollars. Sporadic increases in state appropriations when the economy is growing rapidly can be generous, as in the "dot com" boom of the late 1990s and again as the state economy recovered from the recession of the early 2000s. However, the state budget faces a chronic structural deficit and, in years of weak state budgets, cuts to higher education are likely to continue to be severe.[25]

The adaptability of California higher education and the Master Plan to a radically transformed demographic, fiscal, and educational environment is limited. California has little capacity to set and adjust priorities *across* its higher education systems and programs in response to changing circumstances, particularly at a time when the state has reneged on its basic commitments to college opportunity. Evidence can be found in the continued and costly expansion of the University of California, particularly the new and poorly justified research university at Merced and the plans for new medical and law schools.

A great strength of the Master Plan was its delineation of distinctive missions and governance of each sector, which proved to be effective in meeting the challenges of the 1960s and 1970s. As the systems grew and matured, however, the organizing principle has come to look more like "each train on its own track" or each higher education sector in its own "silo." The same structure that has reinforced differentiated missions may also impede needed collaboration and effective distribution of resources across the higher education systems—for example, the need to work collaboratively with public schools to strengthen college preparation; the need to assure adequate funding for the community colleges, which are the first-line responders in adjusting to changing demographics, population growth, and the weakness of public schools; the need to improve transfer and graduation rates; and the need to expand access and capacity collaboratively through electronic technology.[26]

After the Master Plan resolved the urgent planning issues of the early 1960s, additional measures for assuring statewide planning and coordination were perceived as unnecessary and the mechanisms for these functions have always been weak. The ensuing vacuum in effective statewide policy and planning has contributed to the failure to set statewide priorities. There is a major gulf between the most urgent educational needs of California and the operating and capital priorities of educational and political leaders. This vacuum is partially responsible for the politicization of new campus locations and program allocations. In contrast to the expansion of the 1960s and 1970s, these decisions are not aligned with the educational needs of the state.

When initiatives are launched to address statewide educational needs, they are almost invariably confined to a single sector, which limits their impact even when they are effective. This has been the case with the impressive series of educational improvements initiated over the last decade by the State University under the leadership of Chancellor Charles Reed. These initiatives have included outreach to public schools to raise college aspirations, improve college readiness, and strengthen California's K–12 teaching force.[27]

For at least the past three decades, California's governors and legislators have been reluctant to assert statewide priorities, particularly when confronted with fiscal problems. This deference of state leaders to each of the higher education systems has meant that overall public priorities, such as access, affordability, and the transfer function, have often been inadequately protected in hard economic times and overlooked in good ones.

Unless the erosion of the egalitarian provisions of the Master Plan are reversed, pressures on the organizational arrangements designed in 1960 are likely to mount. Californians may eventually be confronted with issues that have been "off the table" for

the last half-century. If California's colleges and universities as configured by the Master Plan fail to deliver to the current and coming generations opportunities that are comparable to those provided for past generations, public pressure could demand fundamental changes in the structure and governance of higher education, which, after all, are *means* and not *ends*. Options that state and educational leaders have been reluctant to consider in the past may be revisited—for example, regional governance of higher education—in order to find better ways to use scarce state dollars to address California's most pressing challenges.

The consequences of the reduction of college opportunity are manifested in the declining educational attainment of the young adult population. California's older population (ages 65 years and above) ranks eighth in the nation in the percentage that has attended some college or obtained an associate degree, and fifth in the percentage with a baccalaureate degree. In contrast, younger Californians (ages 25 to 35 years) are 41st in the proportion with some college or an associate degree, and 22nd in the percentage with a bachelor's degree.[28] There is also evidence of a growing public awareness of the erosion of college access and its consequences. In 2007, the Public Policy Institute of California found that: almost two-thirds of Californians believe that college is necessary for success in the workplace; large majorities believe that getting a college education has become more difficult and is out of reach for many who are motivated and qualified; and 68% believe the state will need more college-educated workers in the future.[29]

The bold policy blueprint developed for California in the mid–20th Century has become increasingly out of alignment with the state's educational, economic, and demographic realities of this century. Despite rising public concern, governmental and higher education leaders have shown little motivation or capacity to develop a new framework or master plan better suited to the state's current needs and aspirations. It is ironic that the state that first put forth the principle of universal college access has reneged on that principle at a time of major demographic and economic transitions. For the foreseeable future, some California colleges and universities will continue to rank highly in national research ratings and other measures of reputational quality and prestige. However, these accomplishment will be small consolation if they exist as islands in a state otherwise characterized by diminishing educational opportunity, declining levels of educational attainment, and reduced standards of living.

Endnotes

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California Higher Education, the Master Plan, and the Erosion of College Opportunity (February 2009, #09-1). This occasional paper describes the development of the 1960 Master Plan for Higher Education and the current statewide challenges that make the plan ineffective today in preventing the erosion of college opportunity.

Measuring Up 2008: The National Report Card on Higher Education. *Measuring Up 2008* consists of a national report card for higher education (November 2008, #08-4) and 50 state report

cards (#08-3). The purpose of *Measuring Up* is to provide the public and policymakers with information to assess and improve postsecondary education in each state. *Measuring Up 2008* finds that despite modest improvements nationally, large disparities in higher education performance persist, and the nation's global competitiveness is eroding. Visit www.highereducation.org to download *Measuring Up 2008* or to make your own comparisons of state performance in higher education.

Technical Guide for **Measuring Up 2008*: Documenting Methodology, Indicators, and Data Sources*** (November 2008, #08-5).

The Iron Triangle: College Presidents Talk About Costs, Access, and Quality (October 2008, #08-2). This report by Public Agenda explores how college and university presidents view higher education today. Researchers surveyed the presidents on topics including cost, access, and quality, and found a disconnect between the presidents' perspectives on higher education and that of the general public.

Partnerships for Public Purposes: Engaging Higher Education in Societal Challenges of the 21st Century (April 2008, #08-1). This report summarizes the discussion from an invitational roundtable that engaged 15 leaders in higher education. The essay finds that colleges and universities have become preoccupied with advancing their prestige instead of achieving publicly defined purposes, and calls for the restoration of a greater sense of public purpose to learning in ways that directly meet the country's educational needs for the 21st Century.

Good Policy, Good Practice: Improving Outcomes and Productivity in Higher Education: A Guide for Policymakers, by Patrick M. Callan, Peter T. Ewell, Joni E. Finney, and Dennis P. Jones (November 2007, #07-4). This report describes a wide range of successful strategies that states can draw from to increase the educational attainment of their residents while holding down higher education costs. The report also identifies five policy levers that state leaders can use to achieve their overall goals for higher education and, more specifically, to implement the strategies for increasing educational attainment levels.

Investigating the Alignment of High School and Community College Assessments in California, by Richard S. Brown and David N. Niemi (May 2007, #07-3). This study, in examining the math and English expectations for high school students entering California's community colleges, reveals the degree of alignment between what students master in high school versus what is expected for college-level work.

Squeeze Play: How Parents and the Public Look at Higher Education Today, by John Immerwahr and Jean Johnson (May 2007, #07-4). This report by Public Agenda explores how the American public views higher education. Funding for the research was provided by Lumina Foundation for Education as part of its Making Opportunity Affordable initiative.

"Informed Self-Placement" at American River College: A Case Study, by Jonathan E. Felder, Joni E. Finney, and Michael W. Kirst (May 2007, #07-2). This case study of American River College in Sacramento, California, examines replacing the traditional mathematics class placement test with "informed self-placement."

California Community Colleges: Making Them Stronger and More Affordable, by William Zumeta and Deborah Frankle (March 2007, #07-1). This report examines the effectiveness of

statewide policies in assisting the California Community Colleges in meeting their mandate for affordability, and makes recommendations in light of today's public needs.

Measuring Up Internationally: Developing Skills and Knowledge for the Global Knowledge Economy, by Alan Wagner (September 2006, #06-7). In comparing the performance of the United States in higher education with that of advanced, market-economy countries across the globe, this report finds that the United States' leadership position has eroded.

Measuring Up 2006: The National Report Card on Higher Education (September 2006). *Measuring Up 2006* consists of a national report card for higher education (report #06-5) and 50 state report cards (#06-4). The purpose of *Measuring Up 2006* is to provide the public and policymakers with information to assess and improve postsecondary education in each state. For the first time, this edition offers international comparisons with states and the nation as a whole. Visit www.highereducation.org to download *Measuring Up 2006* or to make your own comparisons of state performance in higher education.

> ***Technical Guide for*** **Measuring Up 2006:** ***Documenting Methodology, Indicators, and Data Sources*** (2006, #06-6).

Checks and Balances at Work: The Restructuring of Virginia's Public Higher Education System, by Lara K. Couturier (June 2006, #06-3). This case study of Virginia's 2005 Restructured Higher Education Financial and Administrative Operations Act examines the restructured relationship between the commonwealth and its public colleges and universities. The act gives more autonomy to the public colleges but checks it with new accountability targeted directly to the needs of the state.

American Higher Education: How Does It Measure Up for the 21st Century? by James B. Hunt Jr. and Thomas J. Tierney with a foreword by Garrey Carruthers (May 2006, #06-2). These essays by former Governor James B. Hunt Jr. and business leader Thomas J. Tierney lay out in succinct fashion the requirements of both our nation and our states for new and higher levels of performance from America's colleges and universities.

Claiming Common Ground: State Policymaking for Improving College Readiness and Success, by Patrick M. Callan, Joni E. Finney, Michael W. Kirst, Michael D. Usdan, and Andrea Venezia (March 2006, #06-1). To improve college readiness and success, states can develop policies that better connect their K–12 and postsecondary education systems. However, state action in each of the following policy areas is needed to create college-readiness reform: alignment of coursework and assessments; state finance; statewide data systems; and accountability.

Measuring Up on College-Level Learning, by Margaret A. Miller and Peter T. Ewell (October 2005, #05-8). In this report, the National Forum on College-Level Learning proposes a model for evaluating and comparing college-level learning on a state-by-state basis, including assessing educational capital. As well as releasing the results for five participating states, the authors also explore the implications of their findings in terms of performance gaps by race/ethnicity and educating future teachers.

The Governance Divide: A Report on a Four-State Study on Improving College Readiness and Success, by Andrea Venezia, Patrick M. Callan, Joni E. Finney, Michael W. Kirst, and Michael D. Usdan (September 2005, #05-3). This report, supported by case studies in Florida, Georgia,

New York, and Oregon, identifies and examines policy options available to states that are interested in creating sustained K–16 reform.

The Governance Divide: The Case Study for Florida, by Andrea Venezia and Joni E. Finney (2006, #05-4).

The Governance Divide: The Case Study for Georgia, by Andrea Venezia, Patrick M. Callan, Michael W. Kirst, and Michael D. Usdan (2006, #05-5).

The Governance Divide: The Case Study for New York, by Andrea Venezia, Michael W. Kirst, and Michael D. Usdan (2006, #05-6).

The Governance Divide: The Case Study for Oregon, by Andrea Venezia and Michael W. Kirst (2006, #05-7).

Borrowers Who Drop Out: A Neglected Aspect of the College Student Loan Trend, by Lawrence Gladieux and Laura Perna (May 2005, #05-2). This report examines the experiences of students who borrow to finance their educations, but do not complete their postsecondary programs. Using the latest comprehensive data, this report compares borrowers who drop out with other groups of students, and provides recommendations on policies and programs that would better prepare, support, and guide students—especially low-income students—in completing their degrees.

Case Study of Utah Higher Education, by Kathy Reeves Bracco and Mario Martinez (April 2005, #05-1). This report examines state policies and performance in the areas of enrollment and affordability. Compared with other states, Utah has been able to maintain a system of higher education that is more affordable for students, while enrollments have almost doubled over the past 20 years.

Measuring Up 2004: The National Report Card on Higher Education (September 2004). *Measuring Up 2004* consists of a national report card for higher education (report #04-5) and 50 state report cards (#04-4). The purpose of *Measuring Up 2004* is to provide the public and policymakers with information to assess and improve postsecondary education in each state. For the first time, this edition provides information about each state's improvement over the past decade. Visit www.highereducation.org to download *Measuring Up 2004* or to make your own comparisons of state performance in higher education.

Technical Guide Documenting Methodology, Indicators, and Data Sources for **Measuring Up 2004** (November 2004, #04-6).

Ensuring Access with Quality to California's Community Colleges, by Gerald C. Hayward, Dennis P. Jones, Aims C. McGuinness, Jr., and Allene Timar, with a postscript by Nancy Shulock (May 2004, #04-3). This report finds that enrollment growth pressures, fee increases, and recent budget cuts in the California Community Colleges are having significant detrimental effects on student access and program quality. The report also provides recommendations for creating improvements that build from the state policy context and from existing promising practices within the community colleges.

Public Attitudes on Higher Education: A Trend Analysis, 1993 to 2003, by John Immerwahr (February 2004, #04-2). This public opinion survey, prepared by Public Agenda for the National

Center, reveals that public attitudes about the importance of higher education have remained stable during the recent economic downturn. The survey also finds that there are some growing public concerns about the costs of higher education, especially for those groups most affected, including parents of high school students, African-Americans, and Hispanics.

Responding to the Crisis in College Opportunity (January 2004, #04-1). This policy statement, developed by education policy experts at Lansdowne, Virginia, proposes short-term emergency measures and long-term priorities for governors and legislators to consider for funding higher education during the current lean budget years. *Responding to the Crisis* suggests that in 2004, the highest priority for state higher education budgets should be to protect college access and affordability for students and families.

With Diploma in Hand: Hispanic High School Seniors Talk About Their Future, by John Immerwahr (June 2003, #03-2). This report by Public Agenda explores some of the primary obstacles that many Hispanic students face in seeking higher education—barriers that suggest opportunities for creative public policy to improve college attendance and completion rates among Hispanics.

Purposes, Policies, Performance: Higher Education and the Fulfillment of a State's Public Agenda (February 2003, #03-1). This essay is drawn from discussions of higher education leaders and policy officials at a roundtable convened in June 2002 at New Jersey City University on the relationship between public purposes, policies, and performance of American higher education.

Measuring Up 2002: The State-by-State Report Card for Higher Education (October 2002, #02-7). This report card, which updates the inaugural edition released in 2000, grades each state on its performance in five key areas of higher education. *Measuring Up 2002* also evaluates each state's progress in relation to its own results from 2000.

> ***Technical Guide Documenting Methodology, Indicators, and Data Sources for*** **Measuring Up 2002** (October 2002, #02-8).

State Policy and Community College-Baccalaureate Transfer, by Jane V. Wellman (July 2002, #02-6). This report recommends state policies to energize and improve higher education performance regarding transfers from community colleges to four-year institutions.

Fund for the Improvement of Postsecondary Education: The Early Years (June 2002, #02-5). The Fund for the Improvement of Postsecondary Education (FIPSE) attained remarkable success in funding innovative and enduring projects during its early years. This report, prepared by FIPSE's early program officers, describes how those results were achieved.

Losing Ground: A National Status Report on the Affordability of American Higher Education (May 2002, #02-3). This national status report documents the declining affordability of higher education for American families, and highlights public policies that support affordable higher education. It provides state-by-state summaries as well as national findings.

> ***The Affordability of Higher Education: A Review of Recent Survey Research***, by John Immerwahr (May 2002, #02-4). This review of recent surveys by Public Agenda confirms that Americans feel that rising college costs threaten to make higher education inaccessible for many people.

Coping with Recession: Public Policy, Economic Downturns, and Higher Education, by Patrick M. Callan (February 2002, #02-2). This report outlines the major policy considerations that states and institutions of higher education face during economic downturns.

Competition and Collaboration in California Higher Education, by Kathy Reeves Bracco and Patrick M. Callan (January 2002, #02-1). This report argues that the structure of California's state higher education system limits the system's capacity for collaboration.

Measuring Up 2000: The State-by-State Report Card for Higher Education (November 2000, #00-3). This first-of-its-kind report card grades each state on its performance in higher education. The report card also provides comprehensive profiles of each state and brief states-at-a-glance comparisons.

Beneath the Surface: A Statistical Analysis of the Major Variables Associated with State Grades in **Measuring Up 2000**, by Alisa F. Cunningham and Jane V. Wellman (November 2001, #01-4). Using statistical analysis, this report explores the "drivers" that predict overall performance in *Measuring Up 2000*.

Supplementary Analysis for **Measuring Up 2000*: An Exploratory Report***, by Mario Martinez (November 2001, #01-3). This supplement explores the relationships within and among the performance categories in *Measuring Up 2000*.

Some Next Steps for States: A Follow-up to **Measuring Up 2000**, by Dennis Jones and Karen Paulson (June 2001, #01-2). This report suggests a range of actions that states can take to bridge the gap between state performance identified in *Measuring Up 2000* and the formulation of effective policy to improve performance in higher education.

A Review of Tests Performed on the Data in **Measuring Up 2000**, by Peter Ewell (June 2001, #01-1). This review describes the statistical testing performed on the data in *Measuring Up 2000* by the National Center for Higher Education Management Systems.

Recent State Policy Initiatives in Education: A Supplement to **Measuring Up 2000**, by Aims C. McGuinness, Jr. (December 2000, #00-6). This supplement highlights education initiatives that states have adopted since 1997–1998.

Assessing Student Learning Outcomes: A Supplement to **Measuring Up 2000**, by Peter Ewell and Paula Ries (December 2000, #00-5). This report is a national survey of state efforts to assess student-learning outcomes in higher education.

Technical Guide Documenting Methodology, Indicators, and Data Sources for **Measuring Up 2000** (November 2000, #00-4).

A State-by-State Report Card on Higher Education: Prospectus (March 2000, #00-1). This document summarizes the goals of the National Center's report-card project.

Great Expectations: How the Public and Parents—White, African-American, and Hispanic—View Higher Education, by John Immerwahr with Tony Foleno (May 2000, #00-2). This report by Public Agenda finds that Americans overwhelmingly see higher education as essential for success. Survey results are also available for the following states:

Great Expectations: How Pennsylvanians View Higher Education (May 2000, #00-2b).
Great Expectations: How Floridians View Higher Education (August 2000, #00-2c).
Great Expectations: How Coloradans View Higher Education (August 2000, #00-2d).
Great Expectations: How Californians View Higher Education (August 2000, #00-2e).
Great Expectations: How New Yorkers View Higher Education (October 2000, #00-2f).
Great Expectations: How Illinois Residents View Higher Education (October 2000, #00-2h).

State Spending for Higher Education in the Next Decade: The Battle to Sustain Current Support, by Harold A. Hovey (July 1999, #99-3). This fiscal forecast of state and local spending patterns finds that the vast majority of states will face significant fiscal deficits over the next eight years, which will in turn lead to increased scrutiny of higher education in almost all states, and to curtailed spending for public higher education in many states.

South Dakota: Developing Policy-Driven Change in Higher Education, by Mario Martinez (June 1999, #99-2). This report describes the processes for change in higher education that government, business, and higher education leaders are creating and implementing in South Dakota.

Taking Responsibility: Leaders' Expectations of Higher Education, by John Immerwahr (January 1999, #99-1). This paper reports the views of those most involved with decision-making about higher education, based on focus groups and a survey conducted by Public Agenda.

The Challenges and Opportunities Facing Higher Education: An Agenda for Policy Research, by Dennis Jones, Peter Ewell, and Aims McGuinness, Jr. (December 1998, #98-8). This report argues that due to substantial changes in the landscape of postsecondary education, new state-level policy frameworks must be developed and implemented.

Higher Education Governance: Balancing Institutional and Market Influences, by Richard C. Richardson, Jr., Kathy Reeves Bracco, Patrick M. Callan, and Joni E. Finney (November 1998, #98-7). This publication describes the structural relationships that affect institutional effectiveness in higher education, and argues that state policy should strive for a balance between institutional and market forces.

Federal Tuition Tax Credits and State Higher Education Policy: A Guide for State Policy Makers, by Kristin D. Conklin (December 1998, #98-6). This report examines the implications of the federal income tax provisions for students and their families, and makes recommendations for state higher education policy.

The Challenges Facing California Higher Education: A Memorandum to the Next Governor of California, by David W. Breneman (September 1998, #98-5). This memorandum argues that California should develop a new Master Plan for Higher Education.

Tidal Wave II Revisited: A Review of Earlier Enrollment Projections for California Higher Education, by Gerald C. Hayward, David W. Breneman, and Leobardo F. Estrada (September 1998, #98-4). This review finds that earlier forecasts of a surge in higher education enrollments were accurate.

Organizing for Learning: The View from the Governor's Office, by James B. Hunt Jr., chair of the National Center for Public Policy and Higher Education, and former governor of North

Carolina (June 1998, #98-3). This publication is an address to the American Association for Higher Education concerning opportunity in higher education.

The Price of Admission: The Growing Importance of Higher Education, by John Immerwahr (Spring 1998, #98-2). This report is a national survey of Americans' views on higher education, conducted and reported by Public Agenda.

Concept Paper: A National Center to Address Higher Education Policy, by Patrick M. Callan (March 1998, #98-1). This concept paper describes the purposes of the National Center for Public Policy and Higher Education.

Statement on Competencies in Mathematics Expected of Entering College Students

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This edition of the ICAS Statement on Competencies in Mathematics Expected of Entering College Students is dedicated to the memory of Walter Denham (1934 to 2002). Walter represented the California Department of Education during the writing of the three previous versions. He cared deeply about mathematics education.

Statement on Competencies in Mathematics

Introduction

The goal of this Statement on Competencies in Mathematics Expected of Entering College Students is to provide a clear and coherent message about the mathematics that students need to know and to be able to do to be successful in college. While parts of this Statement were written with certain audiences in mind, the document as a whole should be useful for anyone who is concerned about the preparation of California's students for college. This represents an effort to be realistic about the skills, approaches, experiences, and subject matter that make up an appropriate mathematical background for entering college students.

“Entering College Students” in general refers to students who enter a California postsecondary institution with the goal of receiving a bachelor’s degree. However, it is important that students who plan to enter a California community college be aware that a wide variety of courses exist to help them transition from lower mathematical skill levels to the competencies described in this document. Most community colleges offer a wide range of mathematics courses including some as elementary as arithmetic.

The first section describes some characteristics that identify the student who is properly prepared for college courses that are quantitative in their approach. The second section describes the background in technology, such as calculators, that college students should have. The third section describes the subject matter that is an essential part of the background for all entering college students, as well as describing what is the essential background for students intending quantitative majors. Among the descriptions of subject matter there are sample problems. These are intended to clarify the descriptions of subject matter and to be representative of the appropriate level of understanding. The sample problems do not cover all of the mathematical topics identified.

No section of this Statement should be ignored. Students need the approaches, attitudes, and perspectives on mathematics described in the first section. Students need the experiences with technology described in the second section. And students need extensive skills and knowledge in the subject matter areas described in the third section. Inadequate attention to any of these components is apt to disadvantage the student in ways that impose a serious impediment to success in college. Nothing less than a balance among these components is acceptable for California's students.

The discussion in this document of the mathematical competencies expected of entering college students is predicated on the following basic recommendation:

For proper preparation for baccalaureate level course work, all students should be enrolled in a mathematics course in every semester of high school. It is particularly important that students take mathematics courses in their senior year of high school, even if they have completed three years of college preparatory mathematics by the end of their junior year. Experience has shown that students who take a hiatus from the study of mathematics in high school are very often unprepared for courses of a quantitative nature in college and are unable to continue in these courses without remediation in mathematics.

Section 1

Approaches to Mathematics

This section enumerates characteristics of entering freshmen college students who have the mathematical maturity to be successful in their first college mathematics course, and in other college courses that are quantitative in their approach. A student's first college mathematics course will depend upon the student's goals and preparation. These characteristics are described primarily in terms of how students approach mathematical problems. The second part of this section provides suggestions to secondary teachers of ways to present mathematics that will help their students to develop these characteristics.

Part 1

Dispositions of well-prepared students toward mathematics

Crucial to their success in college is the way in which students encounter the challenges of new problems and new ideas. From their high school mathematics courses students should have gained certain approaches, attitudes, and perspectives:

- A view that mathematics makes sense-students should perceive mathematics as a way of understanding, not as a sequence of algorithms to be memorized and applied.
- An ease in using their mathematical knowledge to solve unfamiliar problems in both concrete and abstract situations—students should be able to find patterns, make conjectures, and test those conjectures; they should recognize that abstraction and generalization are important sources of the power of mathematics; they should understand that mathematical structures are useful as representations of phenomena in the physical world; they should consistently verify that their solutions to problems are reasonable.
- A willingness to work on mathematical problems requiring time and thought, problems that aren't solved by merely mimicking examples that have already been seen-students should have enough genuine success in solving such problems to be confident, and thus to be tenacious, in their approach to new ones.
- A readiness to discuss the mathematical ideas involved in a problem with other students and to write clearly and coherently about mathematical topics—students should be able to communicate their understanding of mathematics with peers and teachers using both formal and natural languages correctly and effectively.
- An acceptance of responsibility for their own learning—students should realize that their minds are their most important mathematical resource, and that teachers and other students can help them to learn but can't learn for them.
- The understanding that assertions require justification based on persuasive arguments, and an ability to supply appropriate justifications-students should habitually ask "Why?" and should have a familiarity with reasoning at a variety of levels of formality, ranging from concrete examples through informal arguments using words and pictures to precise structured presentations of convincing arguments.
- While proficiency in the use of technology is not a substitute for mathematical competency, students should be familiar with and confident in the use of

computational devices and software to manage and display data, to explore functions, and to formulate and investigate mathematical conjectures.

- A perception of mathematics as a unified field of study—students should see interconnections among various areas of mathematics, which are often perceived as distinct.

Part 2

Aspects of Mathematics Instruction to Foster Student Understanding and Success

There is no best approach to teaching, not even an approach that is effective for all students, or for all instructors. One criterion that should be used in evaluating approaches to teaching mathematics is the extent to which they lead to the development in the student of the dispositions, concepts, and skills that are crucial to success in college. Various technologies can be used to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. When strategically used, technology can improve student access to mathematics. It should be remembered that in the mathematics classroom, time spent focused on mathematics is crucial. The activities and behaviors that can accompany the learning of mathematics must not become goals in themselves—understanding of mathematics is always the goal.

While much has been written recently about approaches to teaching mathematics, as it relates to the preparation of students for success in college, there are a few aspects of mathematics instruction that merit emphasis here.

Modeling Mathematical Thinking

Students are more likely to become intellectually venturesome if it is not only expected of them, but if their classroom is one in which they see others, especially their teacher, thinking in their presence. It is valuable for students to learn with a teacher and others who get excited about mathematics, who work as a team, who experiment and form conjectures. They should learn by example that it is appropriate behavior for people engaged in mathematical exploration to follow uncertain leads, not always to be sure of the path to a solution, and to take risks. Students should understand that learning mathematics is fundamentally about inquiry and personal involvement.

Solving Problems

Problem solving is the essence of mathematics. Problem solving is not a collection of specific techniques to be learned; it cannot be reduced to a set of procedures. Problem solving is taught by giving students appropriate experience in solving unfamiliar problems, by then engaging them in a discussion of their various attempts at solutions, and by reflecting on these processes. Students entering college should have had successful experiences solving a wide variety of mathematical problems. The goal is the development of open, inquiring, and demanding minds. Experience in solving problems gives students the confidence and skills to approach new situations creatively, by modifying, adapting, and combining their mathematical tools; it gives students the determination to refuse to accept an answer until they can explain it.

Developing Analytic Ability and Logic

A student who can analyze and reason well is a more independent and resilient student. The instructional emphasis at all levels should be on a thorough understanding of the subject matter and the development of logical reasoning. Students should be asked "Why?" frequently enough that they anticipate the question, and ask it of themselves. They should be expected to construct compelling arguments to explain why, and to understand a proof comprising a significant sequence of implications. They should be expected to question and to explore why one statement follows from another. Their understandings should be challenged with questions that cause them to further examine their reasoning. Their experience with mathematical proof should not be limited to the format of a two-column proof; rather, they should see, understand, and construct proofs in various formats throughout their course work. A classroom full of discourse and interaction that focuses on reasoning is a classroom in which analytic ability and logic are being developed.

Experiencing Mathematics in Depth

Students who have seen a lot but can do little are likely to find difficulty in college. While there is much that is valuable to know in the breadth of mathematics, a shallow but broad mathematical experience does not develop the sort of mathematical sophistication that is most valuable to students in college. Emphasis on coverage of too many topics can trivialize the mathematics that awaits the students, turn the study of mathematics into the memorization of discrete facts and skills, and divest students of their curiosity. By delving deeply into well-chosen areas of mathematics, students develop not just the self-confidence but the ability to understand other mathematics more readily, and independently.

Appreciating the Beauty and Fascination of Mathematics

Students who spend years studying mathematics yet never develop an appreciation of its beauty are cheated of an opportunity to become fascinated by ideas that have engaged individuals and cultures for thousands of years. While applications of mathematics are valuable for motivating students, and as paradigms for their mathematics, an appreciation for the inherent beauty of mathematics should also be nurtured, as mathematics is valuable for more than its utility. Opportunities to enjoy mathematics can make the student more eager to search for patterns, for connections, for answers. This can lead to a deeper mathematical understanding, which also enables the student to use mathematics in a greater variety of applications. An appreciation for the aesthetics of mathematics should permeate the curriculum and should motivate the selection of some topics.

Building Confidence

For each student, successful mathematical experiences are self-perpetuating. It is critical that student confidence be built upon genuine successes—false praise usually has the opposite effect. Genuine success can be built in mathematical inquiry and exploration. Students should find support and reward for being inquisitive, for experimenting, for taking risks, and for being persistent in finding solutions they fully understand. An environment in which this happens is more likely to be an environment in which students generate confidence in their mathematical ability.

Communicating

While solutions to problems are important, so are the processes that lead to the solutions and the reasoning behind the solutions. Students should be able to communicate all of this, but this ability is not quickly developed. Students need extensive experiences in oral and written communication regarding mathematics, and they need constructive, detailed feedback in order to develop these skills. Mathematics is, among other things, a language, and students should be comfortable using the language of mathematics. The goal is not for students to memorize an extensive mathematical vocabulary, but rather for students to develop ease in carefully and precisely discussing the mathematics they are learning. Memorizing terms that students don't use does not contribute to their mathematical understanding. However, using appropriate terminology so as to be precise in communicating mathematical meaning is part and parcel of mathematical reasoning.

Becoming Fluent in Mathematics

To be mathematically capable, students must have a facility with the basic techniques of mathematics. There are necessary skills and knowledge that students must routinely exercise without hesitation. Mathematics is the language of the sciences, and thus fluency in this language is a basic skill. College mathematics classes require that students bring with them ease with the standard skills of mathematics that allows them to focus on the ideas and not become lost in the details. However, this level of internalization of mathematical skills should not be mistaken for the only objective of secondary mathematics education. Student understanding of mathematics is the goal. In developing a skill, students first must develop an understanding. Then as they use the skill in different contexts, they gradually wean themselves from thinking about it deeply each time, until its application becomes routine. But their understanding of the mathematics is the map they use whenever they become disoriented in this process. The process of applying skills in varying and increasingly complex applications is one of the ways that students not only sharpen their skills, but also reinforce and strengthen their understanding. Thus, in the best of mathematical environments, there is no dichotomy between gaining skills and gaining understanding. A curriculum that is based on depth and problem solving can be quite effective in this regard provided that it focuses on appropriate areas of mathematics.

Section 2

Subject Matter

Decisions about the subject matter for secondary mathematics courses are often difficult, and are too-easily based on tradition and partial information about the expectations of the colleges. What follows is a description of mathematical areas of focus that are (1) essential for all entering college students; (2) desirable for all entering college students; (3) essential for college students to be adequately prepared for quantitative majors; and (4) desirable for college students who intend quantitative majors. This description of content will in many cases necessitate adjustments in a high school mathematics curriculum, generally in the direction of deeper study in the more important areas, at the expense of some breadth of coverage.

Sample problems have been included to indicate the appropriate level of understanding for some areas. The problems included do not cover all of the mathematical topics described, and many involve topics from several areas. Entering college students working independently should be able to solve problems like these in a short time—less than half an hour for each problem included. Students must also be able to solve more complex problems requiring significantly more time.

Part 1

Essential areas of focus for all entering college students

What follows is a summary of the mathematical subjects that are an essential part of the knowledge base and skill base for all students who enter higher education. Students are best served by deep mathematical experiences in these areas. This is intended as a brief compilation of the truly essential topics, as opposed to topics to which students should have been introduced but need not have mastered. The skills and content knowledge that are prerequisite to high school mathematics courses are of course still necessary for success in college, although they are not explicitly mentioned here. Students who lack these skills on leaving high school may acquire them through some community college courses.

- *Variables, Equations, and Algebraic Expressions:* Algebraic symbols and expressions; evaluation of expressions and formulas; translation from words to symbols; solutions of linear equations and inequalities; absolute value; powers and roots; solutions of quadratic equations; solving two linear equations in two unknowns including the graphical interpretation of a simultaneous solution. Emphasis should be placed on algebra both as a language for describing mathematical relationships and as a means for solving problems; algebra should not merely be the implementation of a set of rules for manipulating symbols.

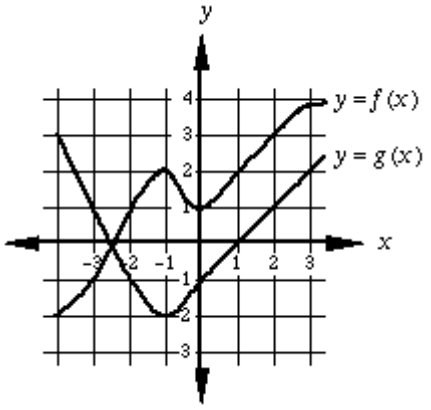
The braking distance of a car (how far it travels after the brakes are applied until it comes to a stop) is proportional to the square of its speed. Write a formula expressing this relationship and explain the meaning of each term in the formula. If a car traveling 50 miles per hour has a braking distance of 105 feet, then what would its braking distance be if it were traveling 60 miles per hour?

Solve for x and give a reason for each step: $\frac{2}{3x+1}+2=\frac{2}{3}$

United States citizens living in Switzerland must pay taxes on their income to both the United States and to Switzerland. The United States tax is 28% of their taxable income after deducting the tax paid to Switzerland. The tax paid to Switzerland is 42% of their taxable income after deducting the tax paid to the United States. If a United States citizen living in Switzerland has a taxable income of $75,000, how much tax must that citizen pay to each of the two countries? Find these values in as many different ways as you can; try to find ways both using and not using graphing calculators. Explain the methods you use.

- *Families of Functions and Their Graphs*: Applications; linear functions; quadratic and power functions; exponential functions; roots; operations on functions and the corresponding effects on their graphs; interpretation of graphs; function notation; functions in context, as models for data. Emphasis should be placed on various representations of functions—using graphs, tables, variables, and words—and on the interplay among the graphical and other representations; repeated manipulations of algebraic expressions should be minimized.

Car dealers use the "rule of thumb" that a car loses about 30% of its value each year. Suppose that you bought a new car in December 1995 for $20,000. According to this "rule of thumb," what would the car be worth in December 1996? In December 1997? In December 2005? Develop a general formula for the value of the car t years after purchase.



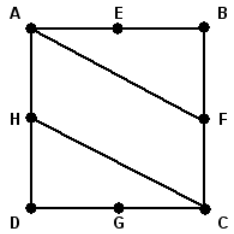
(a) Which is larger, $f(-3)$ or $f(3)$?
(b) Which among the following three quantities
is the largest?
$f(-1) - g(-1)$?
$f(0) - g(0)$?
$f(1) - g(1)$?
(c) For which values of x does $g(x) = f(-3)$?
(d) Find a value of x for which
$f(x) = f(x+2)$

Find a quadratic function of x that has zeroes at x = -1 and x = 2.
Find a cubic function of x that has zeroes at x = -1 and x = 2 and nowhere else.

- *Geometric Concepts:* Distances, areas, and volumes, and their relationship with dimension; angle measurement; similarity; congruence; lines, triangles, circles, and their properties; symmetry; Pythagorean Theorem; coordinate geometry in the plane, including distance between points, midpoint, equation of a circle; introduction to coordinate geometry in three dimensions. Emphasis should be placed on developing an understanding of geometric concepts sufficient to solve unfamiliar problems and an understanding of the need for compelling geometric arguments; mere memorization of terminology and formulas should receive as little attention as possible.

A contemporary philosopher wrote that in 50 days the earth traveled approximately 40 million miles along its orbit and that the distance between the positions of the earth at the beginning and the end of the 50 days was approximately 40 million miles. Discuss any errors you can find in these conclusions or explain why they seem to be correct. You may approximate the earth's orbit by a circle with radius 93 million miles.

ABCD is a square and the midpoints of the sides are *E, F, G,* and *H. AB* =10 in. Use at least two different methods to find the area of parallelogram AFCH.



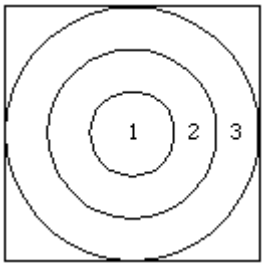
Two trees are similar in shape, but one is three times as tall as the other.
If the smaller tree weighs two tons, how much would you expect the larger tree to weigh?
Suppose that the bark from these trees is broken up and placed into bags for landscaping uses. If the bark from these trees is the same thickness on the smaller tree as the larger tree, and if the larger tree yields 540 bags of bark, how many bags would you expect to get from the smaller tree?

An 82 in. by 11 in. sheet of paper can be rolled lengthwise to make a cylinder, or it can be rolled widthwise to make a different cylinder.
Without computing the volumes of the two cylinders, predict which will have the greater volume, and explain why you expect that.
Find the volumes of the two cylinders to see if your prediction was correct.
If the cylinders are to be covered top and bottom with additional paper, which way of rolling the cylinder will give the greater total surface area?

- *Probability:* Counting (permutations and combinations, multiplication principle); sample spaces; expected value; conditional probability; independence; area representations of probability. Emphasis should be placed on a conceptual understanding of discrete probability; aspects of probability that involve student memorization and rote application of formulas should be minimized.

If you take one jellybean from a large bin containing 10 lbs. of jellybeans, the chance that it is cherry flavored is 20%. How many more pounds of cherry jelly beans would have to be mixed into the bin to make the chance of getting a cherry one 25%?

A point is randomly illuminated on a computer game screen that looks like the figure shown below.



The radius of the inner circle is 3 inches; the radius of the middle circle is 6 inches; the radius of the outer circle is 9 inches.
What is the probability that the illuminated point is in region 1?
What is the probability that the illuminated point is in region I if you know that it isn't in region 2?

A fundraising group sells 1000 raffle tickets at $5 each. The first prize is an $1,800 computer. Second prize is a $500 camera and the third prize is $300 cash. What is the expected value of a raffle ticket?

Ashley, Frank, Jose, Mercedes, and Wade will line up in random order at a movie theater. What is the probability that Ashley and Mercedes stand next to each other?

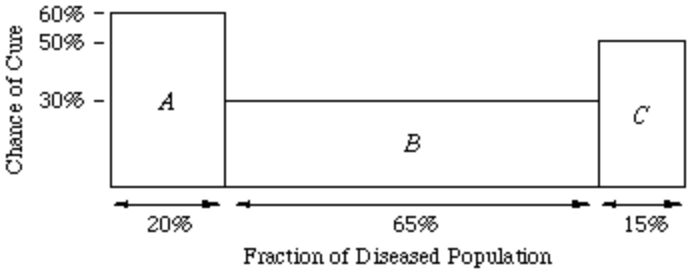
- *Data Analysis and Statistics:* Presentation and analysis of data; measures of center such as mean and median, and measures of spread such as standard deviation and interquartile range; representative samples; using lines to fit data and make predictions. Emphasis should be placed on organizing and describing data, interpreting summaries of data, and making predictions based on the data, with

common sense as a guide; algorithms should be learned with an understanding of the underlying ideas.

The table at the right shows the population of the USA in each of the last five censuses. Make a scatter plot of this data and draw a line on your scatter plot that fits this data well. Find an equation for your line, and use this equation to predict what the population was in the year 1975. Plot that predicted point on your graph and see if it seems reasonable. What is the slope of your line? Write a sentence that describes to someone who might not know about graphs and lines what the meaning of the slope is in terms involving the USA population.

Year	USA Population (Millions)
1960	180.7
1970	205.1
1980	227.7
1990	249.9
2000	281.4

The results of a study of the effectiveness of a certain treatment for a blood disease are summarized in the chart shown below. The blood disease has three types, A, B, and C. The cure rate for each of the types is shown vertically on the chart. The percentage of diseased persons with each type of the disease is shown horizontally on the same chart.



For which type of the disease is the treatment most effective?
From which type of the disease would the largest number of patients be cured by the treatment?
What is the average cure rate of this treatment for all of the persons with the disease?

Jane was on her computer every day one week for the number of hours listed. Find the mean and standard deviation of the time she was on the computer that week.

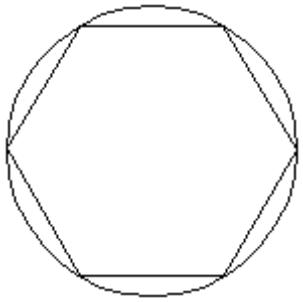
12, 4, 5, 6, 8, 5, 9

Make up another list of seven numbers with the same mean and a smaller standard deviation.
Make up another list of seven numbers with the same mean and a larger standard deviation.

- *Argumentation and Proof:* Logical implication; hypotheses and conclusions; inductive and deductive reasoning. Emphasis should be placed on constructing and recognizing valid mathematical arguments; mathematical proofs should not be considered primarily as formal exercises.

Select any odd number, then square it, and then subtract one. Must the result always be even? Write a convincing argument.

Use the perimeter of a regular hexagon inscribed in a circle to explain why $\pi > 3$.



Does the origin lie inside of, outside of, or on the geometric figure whose equation is $x^2 + y^2 - 10x + 10y - 1 = 0$? Explain your reasoning.

Part 2

Desirable areas of focus for all entering college students

What follows is a brief summary of some of the mathematical subjects that are a **desirable** part of the mathematical experiences for all students who enter higher education. No curriculum would include study in all of these areas, as that would certainly be at the expense of opportunities for deep explorations in selected areas. But these areas provide excellent contexts for the approaches to teaching suggested in Section I, and any successful high school mathematics program will include some of these topics. The emphasis here is on enrichment and on opportunities for student inquiry.

- *Discrete Mathematics:* Topics such as set theory, graph theory, coding theory, voting systems, game theory, and decision theory.
- *Sequences and Series:* Geometric and arithmetic sequences and series; the Fibonacci sequence; recursion relations.
- *Geometry:* Right triangle trigonometry; transformational geometry including dilations; tessellations; solid geometry; three-dimensional coordinate geometry, including lines and planes.
- *Number Theory:* Prime numbers; prime factorization; rational and irrational numbers; triangular numbers; Pascal's triangle; Pythagorean triples.

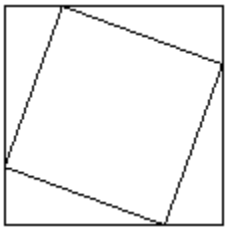
Part 3

Essential areas of focus for students in quantitative majors

What follows is a brief summary of the mathematical subjects that are an **essential** part of the knowledge base and skill base for students to be adequately prepared for science, technology, engineering, and mathematics (STEM) majors. At the very least, any entering college student considering a STEM major should be well prepared to begin a calculus sequence for physical sciences and engineering majors. Students are best served by deep experiences in these mathematical subjects. The skills and content knowledge listed above as essential for all students entering college are of course also essential for these students—moreover, students in quantitative majors must have a deeper understanding of and a greater facility with those areas.

- *Variables, Equations, and Algebraic Expressions:* Solutions to systems of equations, and their geometrical interpretation; solutions to quadratic equations, both algebraic and graphical; complex numbers and their arithmetic; the correspondence between roots and factors of polynomials; rational expressions; the binomial theorem.

In the figure shown to the right, the area between the two squares is 11 square inches. The sum of the perimeters of the two squares is 44 inches. Find the length of a side of the larger square.



Determine the middle term in the binomial expansion of $\left(x-\frac{2}{x}\right)^{10}$

- *Functions:* Rational functions; logarithmic functions, their graphs, and applications; trigonometric functions of real variables, their graphs, properties including periodicity, and applications to right triangle trigonometry; basic trigonometric identities; operations on functions, including addition, subtraction, multiplication, reciprocals, division, composition, and iteration; inverse functions and their graphs; domain and range.

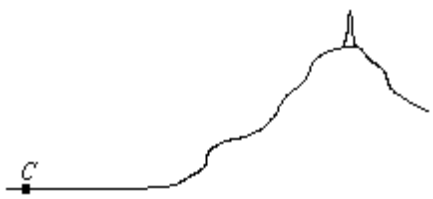
Which of the following functions are their own inverses? Use at least two different methods to answer this, and explain your methods.

$$f(x) = \frac{2}{x}$$
$$g(x) = x^3 + 4$$
$$h(x) = \frac{2+\ln(x)}{2-\ln(x)}$$
$$k(x) = \sqrt[3]{\frac{x^3+1}{x^3-1}}$$

Scientists have observed that living matter contains, in addition to Carbon, C 12, a fixed percentage of a radioactive isotope of Carbon, C14. When the living material dies, the amount of C12 present remains constant, but the amount of C14 decreases exponentially with a half life of 5,550 years. In 1965, the charcoal from cooking pits found at a site in Newfoundland used by Vikings was analyzed and the percentage of C14 remaining was found to be 88.6%. What was the approximate date of this Viking settlement?

Find all quadratic functions of x that have zeroes at x = -1 and x 2.
Find all cubic functions of x that have zeroes at x = -1 and x = 2 and nowhere else.

A cellular phone system relay tower is located atop a hill. You can measure angles and have a calculator. You are standing at point C. Assume that you have a clear view of the base of the tower from point C, that C is at sea level, and that the top of the hill is 2000 ft. above sea level.



Describe a method that you could use for determining the height of the relay tower, without going to the top of the hill.
Next choose some values for the unknown measurements that you need in order to find a numerical value for the height of the tower, and find the height of the tower.

- *Geometric Concepts:* Two- and three-dimensional coordinate geometry; locus problems; polar coordinates; vectors; parametric representations of curves.

> Find any points of intersection (first in polar coordinates and then in rectangular coordinates) of the graphs of $r = 1 + \sin\theta$ and the circle of radius $\frac{3}{2}$ centered about the origin. Verify your solutions by graphing the curves.
> Find any points of intersection (first in polar coordinates and then in rectangular coordinates) of the graphs of $r = 1 + \sin\theta$ and the line with slope 1 that passes through the origin. Verify your solutions by graphing the curves.

> Marcus is in his back yard, and has left his stereo and a telephone 24 feet apart. He can't move the stereo or the phone, but he knows from experience that in order to hear the telephone ring, he must be located so that the stereo is at least twice as far from him as the phone. Draw a diagram with a coordinate system chosen, and use this to find out where Marcus can be in order to hear the phone when it rings.

> A box is twice as high as it is wide and three times as long as it is wide. It just fits into a sphere of radius 3 feet. What is the width of the box?

- *Argumentation and Proof:* Mathematical implication; mathematical induction and formal proof. Attention should be paid to the distinction between plausible or informal reasoning and complete or rigorous demonstrations.

> Select any odd number, then square it, and then subtract one. Must the result always be divisible by 4? Must the result always be divisible by 8? Must the result always be divisible by 16? Write convincing arguments or give counterexamples.

> The midpoints of a quadrilateral are connected to form a new quadrilateral. Prove that the new quadrilateral must be a parallelogram.
> In case the first quadrilateral is a rectangle, what special kind of parallelogram must the new quadrilateral be? Explain why your answer is correct for any rectangle.

Part 4

Desirable areas of focus for students in quantitative majors

What follows is a brief summary of some of the mathematical subjects that are a **desirable** part of the mathematical experiences for students who enter higher education with the possibility of pursuing STEM majors. No curriculum would include study in all of these areas, as that would certainly be at the expense of opportunities for deep explorations in selected areas. But these areas each provide excellent contexts for

the approaches to teaching suggested in Section 1. The emphasis here is on enrichment and on opportunities for student inquiry.

- *Vectors and Matrices:* Vectors in the plane; vectors in space; dot and cross product; matrix operations and applications.
- *Probability and Statistics:* Distributions as models; discrete distributions, such as the Binomial Distribution; continuous distributions, such as the Normal Distribution; fitting data with curves; correlation, regression; sampling, graphical displays of data.
- *Conic Sections:* Representations as plane sections of a cone; focus-directrix properties; reflective properties.
- *Non-Euclidean Geometry:* History of the attempts to prove Euclid's parallel postulate; equivalent forms of the parallel postulate; models in a circle or sphere; seven-point geometry.
- *Calculus:* A high school calculus course should have the same depth, rigor and content as university calculus courses designed for physical sciences and engineering majors. Prior to taking the course, students should have successfully completed four years of secondary school mathematics. Students completing the course should take one of the College Board's Advanced Placement Calculus examinations.

Comments on Implementation

Students who are ready to succeed in college will have become prepared throughout their primary and secondary education, not just in their college preparatory high school classes. Concept and skill development in the high school curriculum should be a deliberately coordinated extension of the elementary and middle school curriculum. This will require some changes, and some flexibility, in the planning and delivery of curriculum, especially in the first three years of college preparatory mathematics. For example, student understanding of probability and data analysis will be based on experiences that began when they began school, where they became accustomed to performing experiments, collecting data, and presenting the data. This is a more substantial and more intuitive understanding of probability and data analysis than one based solely on an axiomatic development of probability functions on a sample space, for example. It must be noted that inclusion of more study of data analysis in the first three years of the college preparatory curriculum, although an extension of the K-8 curriculum, will be at the expense of some other topics. The general direction, away from a broad but shallow coverage of algebra and geometry topics, should allow opportunities for this.

Appendix A

What follows is a collection of skills that students must routinely exercise without hesitation in order to be prepared for college work. These are intended as indicators—students who have difficulty with many of these skills are significantly disadvantaged and are apt to require remediation in order to succeed in college courses. This list is not exhaustive of the basic skills. This is also not a list of skills that are sufficient to ensure success in college mathematical endeavors.

The absence of errors in student work is not the litmus test for mathematical preparation. Many capable students will make occasional errors in performing the skills listed below, but they should be in the habit of checking their work and thus readily recognize these mistakes, and should easily access their understanding of the mathematics in order to correct them.

1. Perform arithmetic with signed numbers, including fractions and percentages.
2. Combine like terms in algebraic expressions.
3. Use the distributive law for monomials and binomials.
4. Factor monomials out of algebraic expressions.
5. Solve linear equations of one variable.
6. Solve quadratic equations of one variable.
7. Apply laws of exponents.
8. Plot points that are on the graph of a function.
9. Given the measures of two angles in a triangle, find the measure of the third.
10. Find areas of right triangles.
11. Find and use ratios from similar triangles.
12. Given the lengths of two sides of a right triangle, find the length of the third side.

Appendix B

This appendix lists the summaries of the subject matter topics presented in Section 2 of the Statement. After each summary, citations of related California Standards (from the *California Mathematics Standards for California Public Schools*, Adopted by the California State Board of Education December, 1997) and the NCTM standards (from *Principles and Standards for School Mathematics*, National Council of Teachers of Mathematics, 2000) are given. There are two reasons for including these citations. One is to show the relationship between the Expected Competencies and the state and national standards. The second is to help teachers and other readers of the Expected Competencies find fuller descriptions of them.

Some words in the cited standards appear in ~~strikethrough type~~. This is done to keep the full citation but indicate that the words struck through are not as closely related to the expected competencies in the summary. The strikethroughs should not be interpreted as indicating that the material is less important, only that it is less directly related to the listed competencies.

The citations of the California standards include abbreviations of course names for grades 8 through 12. The citations of California standards in grades before grade 8 include the grade number and an abbreviation of the strand before the number of the standard.

The citations of the NCTM standards are grade-band specific expectations of content standards as they appear in the Appendix on pages 392-401 of *Principles and Standards*. In order to save space in this document, the standards are specified by their content area and a brief description consisting of some of their keywords.

Part 1

Essential areas of focus for all entering college students.

Variables, Equations, and Algebraic Expressions

- Algebraic symbols and expressions; evaluation of expressions and formulas; translation from words to symbols; solutions of linear equations and inequalities; absolute value; powers and roots; solutions of quadratic equations; solving two linear equations in two unknowns including the graphical interpretation of a simultaneous solution. Emphasis should be placed on algebra both as a language for describing mathematical relationships and as a means for solving problems; algebra should not merely be the implementation of a set of rules for manipulating symbols.

CA Standards

7NS2.0: Students use exponents, powers, and roots and use exponents in working with fractions:
7AF1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:
7AF2.0: Students interpret and evaluate expressions involving integer powers and simple roots:
7AF4.0: Students solve simple linear equations and inequalities over the rational numbers:

AI2: Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
AI3: Students solve equations and inequalities involving absolute values.
AI5: Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
AI6: Students graph a linear equation and compute the *x*- and *y*-intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).
AI8: Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.
AI9: Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.
AI10: Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
AI11: Students apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.
AI18: Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. ~~They also solve quadratic equations in the complex number system.~~

NCTM Standards

AL: Patterns: 9-12: generalize patterns using explicitly defined and recursively defined functions
AL: Patterns: 6-8: represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules
AL: Symbols: 9-12: Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations
AL: Symbols: 9-12: Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases
AL: Symbols: 9-12: Use symbolic algebra to represent and explain mathematical relationships
AL: Symbols: 9-12: judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology
AL: Symbols: 6-8: recognize and generate equivalent forms for simple algebraic expressions and solve linear equations

Families of Functions and Their Graphs

Applications; linear functions; quadratic and power functions; exponential functions; roots; operations on functions and the corresponding effects on their graphs; interpretation of graphs; function notation; functions in context, as models for data. Emphasis should be placed on various representations of functions—using graphs,

tables, variables, and words—and on the interplay among the graphical and other representations; repeated manipulations of algebraic expressions should be minimized.

CA Standards

7AF1.0: Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:
AI15: Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
AI16: Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions.
AI17: Students determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression.
AI18: Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion.
AI21: Students graph quadratic functions and know that their roots are the x-intercepts.
AI23: Students apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.
AI19: Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as a, b, and c vary in the equation $y = a(x - b)^2 + c$.
AI110: Students graph quadratic functions and determine the maxima, minima, and zeros of the function.
AI112: Students ~~know the laws of fractional exponents,~~ understand exponential functions, and use these functions in problems involving exponential growth and decay.

NCTM Standards

NO: Understand operations: 9-12: judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities
AL: Patterns: 9-12: understand relations and functions and select, convert flexibly among, and use various representations for them
AL: Patterns: 9-12: analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior
AL: Patterns: 9-12: understand and compare the properties of classes of functions, including exponential, polynomial, ~~rational, logarithmic, and periodic~~ functions
AL: Patterns: 6-8: identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations
AL: Relationships: 9-12: identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships

Geometric Concepts

- Distances, areas, and volumes, and their relationship with dimension; angle measurement; similarity; congruence; lines, triangles, circles, and their properties; symmetry; Pythagorean Theorem; coordinate geometry in the plane, including distance between points, midpoint, equation of a circle; introduction to coordinate geometry in three dimensions. Emphasis should be placed on developing an

understanding of geometric concepts sufficient to solve unfamiliar problems and an understanding of the need for compelling geometric arguments; mere memorization of terminology and formulas should receive as little attention as possible.

CA Standards

G4: Students prove basic theorems involving congruence and similarity.
G5: Students prove that triangles are congruent or similar, and they are able to use the concept of corresponding parts of congruent triangles.
G7: Students prove and use theorems involving the properties of parallel lines cut by a transversal, the properties of quadrilaterals, and the properties of circles.
G8: Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.
G10: Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.
G11: Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.
G13: Students prove relationships between angles in polygons by using properties of complementary, supplementary, vertical, and exterior angles.
G14: Students prove the Pythagorean theorem.
G15: Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.
G17: Students prove theorems by using coordinate geometry, including the midpoint of a line segment, the distance formula, and various forms of equations of lines and circles.

NCTM Standards

GM: Synthetic: 9-12: Explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them
GM: Synthetic: 6-8: Understand relationships among the angles, side lengths, perimeters, areas, and volumes of similar objects
GM: Analytic: 9-12: investigate conjectures and solve problems involving two- and three-dimensional objects represented with Cartesian coordinates
GM: Transformations: 6-8: examine the congruence, similarity, and line or rotational symmetry of objects using transformations
MS: Systems: 6-8: understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume
MS: Tools: 9-12: understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders

Probability

Counting (permutations and combinations, multiplication principle); sample spaces; expected value; conditional probability; independence; area representations of probability. Emphasis should be placed on a conceptual understanding of discrete probability; aspects of probability that involve memorization and rote application of formulas should be minimized.

CA Standards

AII18: Students use fundamental counting principles to compute combinations and permutations.
AII19: Students use combinations and permutations to compute probabilities.
PS1: Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.
PS2: Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces.

NCTM Standards

NO: Understand operations: 9-12: develop an understanding of permutations and combinations as counting techniques
DA: Probability: 9-12: understand the concept~~s~~ of sample space ~~and probability distribution~~ and construct sample spaces ~~and distributions~~ in simple cases
DA: Probability: 9-12: compute and interpret the expected value of random variables in simple cases
DA: Probability: 9-12: understand the concepts of conditional probability and independent events
DA: Probability: 6-8: compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models

Data Analysis and Statistics

- *Data Analysis and Statistics:* Presentation and analysis of data; measures of center such as mean and median, and measures of spread such as standard deviation and interquartile range; representative samples; using lines to fit data and make predictions. Emphasis should be placed on organizing and describing data, interpreting summaries of data, and making predictions based on the data, with common sense as a guide; algorithms should be learned with an understanding of the underlying ideas.

CA Standards

6SDAP2.0: Students use data samples of a population and describe the characteristics and limitations of the samples:
7SDAP1.0: Students determine theoretical and experimental probabilities and use these to make predictions about events:
PS6: Students know the definitions of the mean, median, and mode of a distribution of data and can compute each in particular situations.
PS7: Students compute the variance and the standard deviation of a distribution of data.
PS8: Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.

NCTM Standards

DA: Data: 9-12: understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable

DA: Data: 9-12: understand histograms, parallel box plots, and scatterplots and use them to display data
DA: Statistics: 9-12: identify trends in bivariate data and find functions that model the data ~~or transform the data so that they can be modeled~~
DA: Statistics: 6-8: find, use, and interpret measures of center and spread, including mean and interquartile range
DA: Inferences: 6-8: make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit

Argumentation and Proof

- Logical implication; hypotheses and conclusions; inductive and deductive reasoning. Emphasis should be placed on constructing and recognizing valid mathematical arguments; mathematical proofs should not be considered primarily as formal exercises.

CA Standards

7MR1.2: Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
7MR2.4: Make and test conjectures by using both inductive and deductive reasoning.
AI24: Students use and know simple aspects of a logical argument:
AI25: Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements:
G1: Students demonstrate understanding by identifying and giving examples of undefined terms, axioms, theorems, and inductive and deductive reasoning.
G3: Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.

NCTM Standards

GM: Synthetic: 9-12: establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others
GM: Synthetic: 6-8: create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship

Part 2

Desirable areas of focus for all entering college students.

Discrete Mathematics

- Topics such as set theory, graph theory, coding theory, voting systems, game theory, and decision theory.

CA Standards

NCTM Standards

GM: Modeling: 9-12: use vertex-edge graphs to model and solve problems

Sequences and Series

- Geometric and arithmetic sequences and series; the Fibonacci sequence; recursion relations.

CA Standards

AII22: Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.
AII23: Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series.

NCTM Standards

Geometry

- *Geometry:* Right triangle trigonometry; transformational geometry including dilations; tessellations; solid geometry; three-dimensional coordinate geometry, including lines and planes.

CA Standards

G9: Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders.
G18: Students know the definitions of the basic trigonometric functions defined by the angles of a right triangle. They also know and are able to use elementary relationships between them. For example, $\tan(x) = \sin(x)/\cos(x)$, $(\sin(x))^2 + (\cos(x))^2 = 1$.
G19: Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.
G22: Students know the effect of rigid motions on figures in the coordinate plane and space, including rotations, translations, and reflections.

NCTM Standards

GM: Synthetic: 9-12: Use trigonometric relationships to determine lengths and angle measures
GM: Transformations: 9-12: understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, ~~vectors,~~ function notation~~, and matrices~~
GM: Transformations: 9-12: use various representations to help understand the effects of simple transformations and their compositions

Number Theory

- Prime numbers; prime factorization; rational and irrational numbers; triangular numbers; Pascal's triangle; Pythagorean triples.

CA Standards

NCTM Standards

NO: Understand numbers: 9-12: compare and contrast the properties of numbers and number systems, including the rational and real numbers~~, and understand complex numbers as solutions to quadratic equations that do not have real solutions~~
NO: Understand numbers: 9-12: use number-theory arguments to justify relationships involving whole numbers
NO: Understand numbers: 6-8: use factors, multiples, prime factorization, and relatively prime numbers to solve problems

Part 3

Essential areas of focus for students in quantitative majors

Variables, Equations, and Algebraic Expressions

- Solutions to systems of equations, and their geometrical interpretation; solutions to quadratic equations, both algebraic and graphical; complex numbers and their arithmetic; the correspondence between roots and factors of polynomials; rational expressions; the binomial theorem.

CA Standards

AI12: Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.
AI13: Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
AI14: Students solve a quadratic equation by factoring or completing the square.
AI19: Students know the quadratic formula and are familiar with its proof by completing the square.
AI20: Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.
AII2: Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.
AII4: Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.
AII5: Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex number as points in the plane.
AII6: Students add, subtract, multiply, and divide complex numbers.
AII8: Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.
AII20: Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.
T17: Students are familiar with complex numbers. They can represent a complex number in polar form and know how to multiply complex numbers in their polar form.

NCTM Standards

NO: Understand numbers: 9-12: compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions
AL: Symbols: 9-12: write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases

Functions

- Rational functions; logarithmic functions, their graphs, and applications; trigonometric functions of real variables, their graphs, properties including periodicity, and applications to right triangle trigonometry; basic trigonometric identities; operations on functions, including addition, subtraction, multiplication, reciprocals, division, composition, and iteration; inverse functions and their graphs; domain and range.

CA Standards

AII11.0: Students prove simple laws of logarithms.
AII12: Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.
AII24: Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.
T2: Students know the definition of sine and cosine as y- and x-coordinates of points on the unit circle and are familiar with the graphs of the sine and cosine functions.
T3.2: Students prove other trigonometric identities and simplify others by using the identity $\cos^2(x) + \sin^2(x) = 1$. For example, students use this identity to prove that $\sec^2(x) = \tan^2(x) + 1$.
T4: Students graph functions of the form $f(t) = A\sin(Bt + C)$ or $f(t) = A\cos(Bt + C)$ and interpret A, B, and C in terms of amplitude, frequency, period, and phase shift.
T5: Students know the definitions of the tangent and cotangent functions and can graph them.
T6: Students know the definitions of the secant and cosecant functions and can graph them.
T8: Students know the definitions of the inverse trigonometric functions and can graph the functions.
T10: Students demonstrate an understanding of the addition formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities.
T11: Students demonstrate an understanding of half-angle and double-angle formulas for sines and cosines and can use those formulas to prove and/or simplify other trigonometric identities.
MA4: Students know the statement of, and can apply, the fundamental theorem of algebra.
MA6: Students find the roots and poles of a rational function and can graph the function and locate its asymptotes.
MA7: Students demonstrate an understanding of functions and equations defined parametrically and can graph them.

NCTM Standards

AL: Patterns: 9-12: understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions~~, using technology to perform such operations on more-complicated symbolic expressions~~
AL: Patterns: 9-12: understand and compare the properties of classes of functions, including ~~exponential, polynomial,~~ rational, logarithmic, and periodic functions

Geometric Concepts

- Two- and three-dimensional coordinate geometry; locus problems; polar coordinates; vectors; parametric representations of curves.

CA Standards

T15: Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates and vice versa.
T16: Students represent equations given in rectangular coordinates in terms of polar coordinates.
MA1: Students are familiar with, and can apply, polar coordinates and vectors in the plane. In particular, they can translate between polar and rectangular coordinates and can interpret polar coordinates and vectors graphically.
MA7: Students demonstrate an understanding of functions and equations defined parametrically and can graph them.

NCTM Standards

AL: Symbols: 9-12: use a variety of symbolic representations, including ~~recursive and~~ parametric equations, for functions and relations;
GM: Analytic: 9-12: use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations

Argumentation and Proof

- Mathematical implication; mathematical induction and formal proof. Attention should be paid to the distinction between plausible or informal reasoning and complete or rigorous demonstrations.

CA Standards

G2: Students write geometric proofs, including proofs by contradiction.
AII21: Students apply the method of mathematical induction to prove general statements about the positive integers.
MA3: Students can give proofs of various formulas by using the technique of mathematical induction.

NCTM Standards

Part 4

Desirable areas of focus for students in quantitative majors

Vectors and Matrices

- Vectors in the plane; vectors in space; dot and cross product; matrix operations and applications.

CA Standards

LAintroduction: The general goal in this discipline is for students to learn the techniques of matrix manipulation so that they can solve systems of linear equations in any number of variables.

NCTM Standards

NO: Understand operations: 9-12: develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices
NO: Compute and estimate: 9-12: develop fluency in operations with ~~real numbers,~~ vectors, and matrices, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases.

Probability and Statistics

- *Probability and Statistics:* Distributions as models; discrete distributions, such as the Binomial Distribution; continuous distributions, such as the Normal Distribution; fitting data with curves; correlation, regression; sampling, graphical displays of data.

CA Standards

PS4: Students are familiar with the standard distributions (normal, binomial, and exponential) and can use them to solve for events in problems in which the distribution belongs to those families.
APPS12: Students find the line of best fit to a given distribution of data by using least squares regression.
APPS15: Students are familiar with the notions of a statistic of a distribution of values, of the sampling distribution of a statistic, and of the variability of a statistic.
APPS16: Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.

NCTM Standards

DA: Data: 9-12: know the characteristics of well-designed studies, including the role of randomization in surveys and experiments
DA: Statistics: 9-12: for univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics
DA: Statistics: 9-12: for bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools

Conic Sections

- Representations as plane sections of a cone; focus-directrix properties; reflective properties.

CA Standards

AII16: Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it.
AII17: Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.

NCTM Standards

Non-Euclidean Geometry

- History of the attempts to prove Euclid's parallel postulate; equivalent forms of the parallel postulate; models in a circle or sphere; seven-point geometry.

CA Standards

NCTM Standards

Calculus

- *Calculus:* A high school calculus course should have the same depth, rigor and content as university calculus courses designed for physical sciences and engineering majors. Prior to taking the course, students should have successfully completed four years of secondary school mathematics. Students completing the course should take one of the College Board's Advanced Placement Calculus examinations.

CA Standards

NCTM Standards

INSTITUTE FOR HIGHER EDUCATION
LEADERSHIP & POLICY

CRAFTING A STUDENT-CENTERED TRANSFER PROCESS IN CALIFORNIA: LESSONS FROM OTHER STATES

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Executive Summary

California is Facing a Shortage of College-Educated Workers

The supply of workers with a bachelor's degree will not meet the projected demands due to the retirement of the highly-educated baby boom generation and the reduced migration of college-educated workers into California from other states and countries. Under current trends, by 2025 there will be one million fewer college graduates than are needed in the workforce. This gap could be narrowed by increased college attendance rates, increased transfer rates from community colleges to four-year universities, and increased graduation rates from universities.

Improving Community College Transfer Rates is Key

In California, community colleges play a major role in producing baccalaureate degrees. Under the Master Plan for Higher Education, the vast majority of college students in California begin their college education in a community college. Access to the baccalaureate for these students is provided through the transfer process.

While a large number of university graduates are community college transfers, data on transfer rates show that only a small percentage of students who begin in community colleges successfully transfer. When students do transfer, the process is often inefficient or incomplete. Some students transfer with many units that don't count toward the specific requirements for a bachelor's degree. Others transfer without completing a transfer curriculum, reducing the potential cost-efficiency benefits of completing lower division requirements in the lower-cost community college system. Finally, many students transfer to a four-year university without earning an associate degree, and those who do not graduate are left without any degree.

With budget cuts creating additional barriers to college completion for students and institutions, it is important to improve the transfer process so transfer students will move efficiently along a well-defined transfer pathway.

Complex Transfer Process Poses Hurdles for Students

The decentralized, segmental structure of California higher education and the strong tradition of local faculty autonomy over curriculum have set the framework for transfer policies and made it difficult to engage in comprehensive, state-level planning. The result has been campus-to-campus rather than system-wide course transferability agreements. Faculty at each college and university are responsible for setting each campus's program requirements, which leads to differing lower division major prerequisites, even within the same major within the same system. Each university system emphasizes a different general education pattern, contributing to the complexity of transfer options and requirements that are often confusing to students. With budget cuts and enrollment pressures leading to more crowded and "impacted" majors, community college students can find transfer admission requirements to have changed just when they think they have met them. In short, transfer requirements can present a blurry and moving target for students seeking to transfer.
Such a complex process is especially confusing to under-prepared and first-generation students, who predominate in the community colleges. The community colleges do not have a robust network of support services, including an adequate number of counselors and advisors, to help students navigate through the complex transfer process. Recent reform efforts have seen little success and have arguably added more complexity to the transfer process because they have been limited to the traditional paradigm of local agreements rather than statewide patterns.

Lessons from Other States

For this report, transfer processes and structures in the following states were reviewed: Arizona, Florida, New Jersey, North Carolina, Ohio, Oregon, Texas, and Washington. These states are known for having statewide transfer patterns, for strong community college and public university relationships, or for being innovative with regard to student success. These states confronted similar issues in designing their transfer processes, including:

- Navigating governance issues to determine the appropriate entity for coordinating transfer policy statewide
- Finding the right trade-off between standardization and local autonomy across the state's higher education system
- Integrating lower division major requirements with standard general education curricula
- Deciding at what point transfer students should be expected to declare a major
- Targeting high-demand majors to meet specific workforce needs
- Designing and developing adequate advising tools and services to help students navigate the transfer process.

A review of these states points to several models that could be considered in the development of a more standardized, statewide transfer policy in California.

1. A set of statewide associate degrees designed for transfer in different fields, which would include general education and defined major requirements
2. A set of pathways that consist of a standard statewide general education curriculum combined with specific major lower division requirements, but with no corresponding transfer associate degrees awarded upon completion
3. Statewide general education curriculum for early transfer to a university with lower-division status, in order to take major prerequisites at the receiving university.

Recommendations

California's transfer requirements should be designed first and foremost to help students meet their educational goals efficiently so that California's postsecondary education system can keep the state's economy competitive. Specifically, they should be:

- *Effective* in creating pathways that lead to more community college students transferring to universities and earning bachelor's degrees
- *Efficient* in minimizing the number of unnecessary credits students earn on the path to a degree
- *Transparent* and easy to understand for students, families, and counselors
- *Robust* in accommodating the requirements of multiple major programs
- *Strategic* in targeting majors that meet high-priority state needs
- *Feasible* in balancing stakeholder desires for change with institutional interest in setting standards and requirements for transfer.

Legislation that accomplishes the following would satisfy the above conditions and produce a set of student-centered policies:

- Development at the California Community Colleges (CCC) of associate degrees for transfer that entitle students to admission to a public university and a guaranteed transfer of all degree credits
- Development of standardized general education and major preparation requirements across all segments for a common set of majors to serve as requirements for an associate degree for transfer in that field and transfer into that major, with allowances for minimal variations across institutions.
- A guarantee that students with an associate degree for transfer with major preparation are admitted as juniors, with allowance for the University of California and the California State University to require additional lower division major preparation courses if necessary *after* transfer
- Development of a degree audit system to allow counselors and students to determine how the courses students have completed match up to requirements for degrees/transfer and to allow the CCC to automatically issue associate degrees to students who have completed all requirements
- Authority for the CCC to continue to award non-transfer, terminal associate degrees or applied associate degrees.

California's Higher Education System is Producing Too Few Bachelor's Degrees

Workforce Shortages Pose a Threat to Economic Health

California's economic position among states is declining, as the state's ranking in the share of the population with a bachelor's degree falls steadily with each younger age group (Table 1). A recent series of analyses and reports by the Public Policy Institute of California (PPIC) makes a compelling case that:

- Over the next fifteen years or so, the supply of workers with at least a bachelor's degree will not meet the projected demand in California's economy, due to the retirement of the highly-educated baby boom generation and demographic shifts in the workforce toward groups that have historically low rates of earning college degrees.[1]
- The state will not be able to import enough college-educated workers from other states and countries to meet the demand, and must concentrate on producing more graduates among its own population if it hopes to address the shortfall.[2]
- By 2025, the state will have about one million fewer college graduates than are needed in the workforce under current trends, a gap that could be substantially narrowed through a combination of efforts to (1) increase college attendance rates, (2) increase transfer rates from community colleges to four-year universities, and (3) increase graduation rates at universities.[3]

Table 1
California is Becoming Less Educated than Other States

Age Group	Rank among States in Share of Population with Bachelor's Degree or Higher
65 and older	4th
45 to 64	13th
35 to 44	17th
25 to 34	25th

Source: NCHEMS Information Center for Higher Education Policymaking and Analysis (www.higheredinfo.org) based on data from the US Census Bureau, 2007 American Community Survey

The severe economic downturn that has swept the nation, and hit California particularly hard, may dampen the demand for all workers, including college-educated workers, in the short term. But California's weakening position relative to other states is the key issue that calls for action now and as the economy recovers.

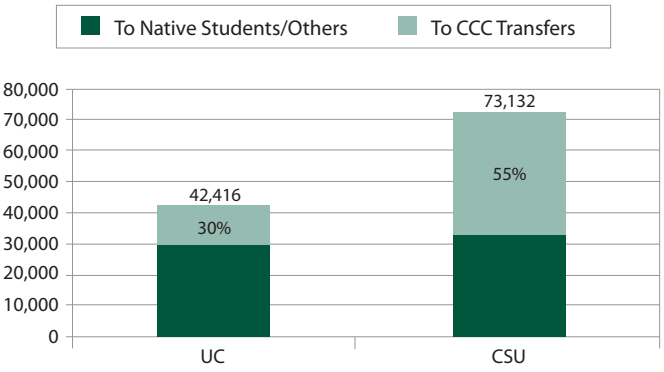
Community College Transfer is Key, but Too Many Students Fail to Transfer

The Obama administration has made it a national priority to recognize and bolster the role that the nation's community colleges play in economic development. Nowhere is this more important than California, because the state's community colleges play a bigger role in producing baccalaureate degrees than is the case in other states where a larger portion of students begin in four-year institutions. Under the California Master Plan for Higher Education, access to the state's public universities is limited to the top one-third of high school graduates, but all students are provided access to baccalaureate education through the California Community Colleges (CCC). The Master Plan specifically guarantees transfer (and priority in admissions) to a four-year public university for community college students who have completed a prescribed plan of study with a satisfactory grade point average.

California's policy commitment to using the community college system as a major access point to the baccalaureate is apparent in the numbers. In 2007-08, nearly 55,000 CCC students transferred to the California State University (CSU) and another 14,000 transferred to the University of California (UC).[4] In 2008, over half of the bachelor's degrees issued by CSU were awarded to students who had transferred to the system from a community college, and 30 percent of the bachelor's degrees issued by UC were awarded to CCC transfers (Figure 1).

The large portion of UC/CSU graduates who transferred from a community college masks the problem that only a small percentage of students who begin in community college successfully transfer, a problem shared by many other states.[5] While methods for computing transfer rates vary, several recent studies found rates in the CCC

Figure 1
Bachelor's Degrees Awarded, 2008



Source: California Postsecondary Education Commission, Custom Data Reports, Degrees/Completions–Source Institution, 2008

to be low relative to the number of students that likely enrolled with an intent to transfer. One found that about one-quarter of "transfer-focused" students transferred; another found that among students seeking a college credential, 18 percent transferred; and several others found transfer rates generally ranging between 20 and 30 percent using different assumptions about who should be included in the pool of potential transfer students. The CCC system's own method for calculating transfer rates, which defines fewer students as seeking transfer than do these other computations, results in a finding that only 40 percent of students intending to transfer actually do so.[6] Despite the large number of bachelor's degrees awarded to former CCC students, the data on transfer rates suggest that the transfer process is not working effectively for students.

Where Transfer Does Occur, It is Often Inefficient or Incomplete

The community college transfer process can be an efficient road to the baccalaureate, allowing students to complete lower-division courses at a lower cost to both students and the state. Under ideal circumstances, a student completes 60 semester credits at a community college, including all lower-division general education (GE) requirements and prerequisite courses for a major, and then completes an additional 60 credits of upper-division coursework at a university for the typical bachelor's degree requiring a total of 120 credits. However, few CCC students follow this ideal transfer path to the baccalaureate.

Many Transfer Students Graduate from a University with "Excess" Units

A CSU study showed that transfer students graduated with an average of 141 semester units.[7] The excess units resulted from course-taking actions at both the CCC and CSU campuses. Transfer students often arrived at the CSU with more than the required 60 transferable CCC credits; a separate study found that transfer students earn an average of 75 CCC credits.[8] The CSU study found that transfers earned an average of 76 credits at the CSU, with some of the extra coursework likely related to units taken at the CCC that did not count toward the degree.[9] In a UC study, students reported that excess units taken at the CCC before transfer were related to exploring various fields, changing majors, poor advising, and preparing for multiple universities with different admission requirements.[10] Excess units increase the cost of a degree to both students and the state, and limit access because students are taking up seats in courses that could otherwise be filled with additional students.

CCC Students Often Transfer to a University without Completing a Transfer Curriculum

There is reason to believe that published transfer rates overstate actual transfer success. Many students transfer to a university after earning far fewer than 60 units. Our analysis of a cohort of first-time CCC students[11] shows that, among students who transferred, nearly half (46%) did so without having completed a transfer curriculum. On average, such students had completed only 31 units upon transfer and one-third of them had completed fewer than 15 units. Most students who transferred without completing a transfer curriculum transferred to in-state private or out-of-state institutions, since UC and CSU have taken few lower-division transfers in recent years. Little is known about the degree outcomes of CCC students who transfer to private universities. It is reasonable to assume that outcomes are good for students transferring to private non-profit universities given the generally high graduation

rates of students in many of those institutions.[12] However, there is reason for concern about outcomes among the growing numbers of CCC students transferring to for-profit universities, as available data indicate that graduation rates in some of those institutions are quite low.[13]

Some Transfer Students Do Not Complete Any Degree

More than 80 percent of CCC transfers to UC graduate within four years of transfer,[14] and approximately two-thirds of transfers to CSU graduate within six years,[15] a generous period of time for tracking graduation given that students generally enter with two years of credit toward the degree.[16] That leaves a substantial number of transfer students in the public universities who do not ultimately earn a bachelor's degree. Since most CCC transfer students do not earn an associate degree before transferring,[17] students can be left with no college credential despite a major investment in higher education by both the students and the state. More effective transfer pathways to public universities, and awarding the associate degree along the way, would help increase the number of students who earn college degrees.

Budget Cuts Raise Additional Challenges

The severe budget cuts included in the 2009-2010 state budget (and likely beyond) are resulting in sizeable, planned enrollment reductions in all three postsecondary segments. With the state already earning low grades for college participation and degree completion,[18] California's colleges and universities face daunting challenges in striving to address the projected shortages of college-educated Californians. Although the challenge in California may be extreme, most states are in the same position of trying to raise education levels within shrinking budgets. Improving the efficiency of public postsecondary education systems is the only way that this agenda can be accomplished.

The Obama administration, in its focus on economic recovery, has highlighted not only the importance of community colleges, but also the need to improve college completion and efficiency so that states can more often and more quickly reap the benefits of their investments in higher education. In California, improving the transfer process can contribute greatly to improved efficiency of the entire state postsecondary system. In the short term, with the CCC facing enrollment demand that far exceeds capacity and with UC and CSU likely accepting fewer transfer students, a streamlined transfer process becomes more important than ever: CCC transfer students should move efficiently along a well-defined transfer pathway and they should not be forced to repeat courses, at a university, that they have been told would transfer. Not only would such a process increase college completion rates, but it would free up much-needed space in colleges and universities by reducing unnecessary course enrollments.

Clearly, in the short term there will be tough choices to make if all fully prepared transfer students are to be accommodated at UC and CSU. We offer this analysis of the transfer issue in the expectation that circumstances will improve and that in the longer term the state will be well served by an efficient, student-centered transfer policy that will lead to more college-educated Californians. And in the short term, there is nothing to be gained and much to be lost by assuming that improvements to the transfer process must wait for better budget times.

This policy brief discusses the shortcomings of the current transfer process and explores what several other states have done to attempt to make their transfer processes work better for students. The goal is to draw on these other states' experiences to improve transfer in California. Each legislative session in California brings attempts to improve transfer. It is important that these efforts be informed by the good work that is underway in other states.

We cannot claim authoritatively that these other states produce better results than California does, although we do present some evidence of their effectiveness. There is no accurate way to compare transfer rates across states. The only basis for comparison is the federal reporting system, the Integrated Postsecondary Education Data System (IPEDS), but that system has serious limitations that make the data unhelpful in understanding community college student outcomes.[19] The most

glaring limitation is its inclusion of only first time, full-time students who make up a small portion of the community college enrollment in most states. Furthermore, transfer rates computed and reported by individual states reflect a wide variety of definitions and cannot be meaningfully compared. Nevertheless, we believe there are lessons that can be learned from these other states, particularly since California lawmakers and educators have struggled with the issue of community college transfer for so long and it still remains a complicated and frustrating process for students.

The Transfer Process Is Extremely Complex

Systemic Issues of Governance and Mission Have Shaped Transfer

Several structural characteristics of California's higher education system have established the framework for transfer and have posed real challenges for efforts to design a transfer process that appears seamless from the perspective of the student seeking to transfer.

Decentralization of Higher Education

The complexity of transfer is rooted in the segmental structure of higher education in California and the tradition of institutional autonomy. The fundamental feature of the 1960 Master Plan for Higher Education is the formalization of three separate segments of higher education with carefully differentiated missions. While seen at the time, and valuable over the years, as a protection against institutional competition and wasteful duplication, the strict segmental structure has shaped policy and planning for higher education and limited the ability to engage in comprehensive planning on issues like transfer that span across segments.[20] Coordination among the three segments is further complicated because the community college system in California is not a true "system" but rather 72 local community college districts (comprising 110 colleges) each with its own governing board and faculty contracts, and considerable variation in curriculum. The transfer process within this decentralized system of higher education is based primarily on campus-to-campus, rather than system-wide, course articulation agreements resulting in complex transfer options and requirements that are confusing to students.

Local Faculty Autonomy over Curriculum

There is a strong tradition of faculty governance and control of academic issues at both the community colleges and the universities in California. The faculty at each college and university expect to set the requirements for each of their programs. For example, faculty at one CSU campus might argue that their undergraduate program in a particular discipline is unique and calls for different lower-division course prerequisites than would be appropriate for the program in that discipline at another CSU. The campus-to-campus articulation agreements for each major pose a significant challenge for CCC students in understanding the different requirements to transfer to the 23 CSU and 10 UC campuses, particularly for students who enter college without knowing what major they want to pursue and which university campus they want to attend. They also pose a challenge for students whose plans about which university to attend change for personal or professional reasons. There is a natural tension between faculty interest in controlling their institution's academic programs and students' interest in moving efficiently through the process to earn a bachelor's degree. The pressing needs of the state's economy suggest it is time to give additional weight to student interests.

Inadequate Student Support Infrastructure

Success in such a decentralized and complex transfer system is dependent on having either exceptionally savvy and well-prepared students or a robust network of support services to help students navigate the process. Neither of those conditions prevails in the CCC, which is assigned the mission of serving all students regardless of academic preparation, and which receives the lowest per-student support from the state among the three segments. The majority of CCC students are academically underprepared for college and many are the first in their families to attend college, giving them few resources for navigating a complex transfer process. The number of counselors at the CCC is grossly insufficient to help students choose among the complex options, with estimates of the ratio of counselors to students in the CCC as high as one counselor per 1,200 to 1,900 students.[21] The colleges do not make widespread use of advisors and paraprofessionals who could supplement the services of professional counseling staff.

Navigating the Options is Difficult for Students

The maze of requirements facing a California community college student designing an individual transfer plan is frustratingly difficult to navigate. In order to ensure that the courses they take will transfer, students must identify early in their community college career the specific university and major in which they want to enroll, because the individual articulation agreements vary substantially across universities, even for the same major. By the time they identify a major and a university, many students

find they have taken courses that will not meet a specific requirement at that particular university. They end up having to take more courses than they need and want, extending the time to transfer, increasing their own educational costs, and reducing efficiency of the state's postsecondary system. And, given the growing number of majors and campuses in the university systems that are considered "impacted" for purposes of admission,[22] CCC students can find that just when they think they have met the requirements for transfer to a particular program, those requirements are changed so that additional courses or a higher grade point average are required. In short, transfer requirements can present a blurry and moving target.

Students face navigation complexities of two kinds: meeting general education requirements (about 39 units) for transfer and satisfying the lower division requirements for a specific major with the remainder of the 60 units.

Complexities in General Education Requirements

Each university system has its own general education pattern. The Intersegmental General Education Transfer Curriculum (IGETC) is primarily used by UC, although it is also accepted by the CSU. The CSU-breadth pattern, while similar, contains some important differences. CSU Breadth is generally recommended for students who are certain they want to attend a CSU. Students who are not sure if they are CSU or UC bound are generally advised to follow IGETC. These two patterns are not the only options, with some major programs at UC and CSU recommending different GE patterns, especially those that require extensive lower-division major preparation (e.g., science and engineering programs). Table 2 shows the course patterns for IGETC and CSU-breadth, with the differences between them indicated in italics.

Table 2
Comparison of IGETC and CSU-Breadth Requirements

	UC IGETC	CSU-Breadth
English Communications	One course in English composition	One course in English composition
Critical Thinking	*Second composition course emphasizing critical thinking*	*Stand-alone course in critical thinking*
Oral Communications	*Not required*	*One course required*
Mathematical Concepts/ Quantitative Reasoning	One course required	One course required
Arts and Humanities	Three courses, at least one in arts and one in humanities	Three courses, at least one in arts and one in humanities
Social and Behavioral Sciences	Three courses from at least two disciplines	Three courses from at least two disciplines
Physical and Biological Sciences	Two courses, one in each area	Two courses, one in each area
American Institutions	*Not required*	*One course in U.S. history and one course in government**
Foreign Languages	*Proficiency equivalent to two years of high school study*	*Not required*
Lifelong Understanding and Self Development	*Not required*	*One course required*
Certification of GE completion	*Complete package must be completed to be certified*	*Certification done area by area*

* The courses in American government and history are not technically part of CSU-Breadth GE requirements, but are CSU graduation requirements that most students complete as part of their lower-division coursework.

The Transfer Process Is Extremely Complex

Complexities in Lower Division Major Prerequisites

The ideal transfer pattern would prepare a student to enroll in a university as a junior with all lower division major requirements completed. The reality is far removed from the ideal because lower-division transfer requirements are defined by the receiving institution and vary by campus, even within the same system. For example, the lower division requirements for a psychology major at San Jose State are different from those at Sonoma State and Sacramento State – all campuses in the north state region among which a student might be choosing. Theoretically, the lower division requirements could be different at each of the CSU and UC campuses. Such variation almost guarantees that students will end up having to take more than 60 transferable units unless they know early on to which campus they plan to transfer *and* they get admitted to that first choice campus.

To illustrate, Table 3 shows the lower-division major requirements for Psychology in three CSU campuses and three UC campuses.[23] Further complicating student planning are differences among these campuses' psychology degree requirements with respect to upper-division general education courses and residency requirements, i.e., which specific courses must be taken at that specific campus.

Table 3
An Example: Lower Division Major Preparation – BA in Psychology

CSU		
San Jose State	**Sacramento State**	**Sonoma State**
■ General Psychology ■ Introductory Psychobiology ■ Elementary Statistics ■ Human Biology or Human Anatomy ■ 3 units of any transferable psychology elective	■ Introductory Psychology: Basic Processes ■ Introductory Psychology: Individual and Social Processes ■ Methods of Psychology	■ Statistics ■ 6 units of lower division psychology (unspecified)
UC		
UC Davis	**UC Santa Cruz**	**UC Merced**
■ General Psychology ■ Research Methods in Psychology ■ Elementary Statistics ■ Sociology or Cultural Anthropology ■ One of several options: (1) Introductory Biology or (2) Essentials of Life on Earth or (3) General Biology and either Human Evolutionary Biology or Introduction to Human Heredity or Exercise and Fitness: Principles and Practice	■ Introduction to Psychology ■ Research Methods in Psychology ■ Introduction to Psychological Statistics ■ Precalculus ■ Introduction to Developmental Psychology	■ Introduction to Psychology ■ Two natural science or engineering courses, at least one with a lab, field or studio component ■ Cultural Anthropology or Intro. to Cognitive Science or Intro. to Economics or Intro. to Political Science or Intro. to Public Policy or Intro. to Sociology ■ Two other lower-division courses for the major could be completed after transfer: Analysis of Psychological Data and Research Methods

Numerous Reform Efforts Have Not Produced a Student-Centered Transfer Process

The transfer process remains exceedingly complex, despite numerous reform efforts over the years. In fact, one could argue that efforts to improve the process have contributed to the complexity, as suggested by the medley of transfer initiatives listed in Table 4. Many of the reforms have been instituted as an effort of only one of the three public segments, or have been required by legislation but never fully embraced or adhered to by all of the segments. Simplifying and standardizing the transfer process in a way that makes it more transparent for students would require leaders at the state level to think outside the "silos," and would call on institutional leaders to concede some of their local control in the interests of better serving students and meeting the educational needs of the state.

Lower Division Transfer Patterns: An Example of Structural Impediments to Reform

The Lower Division Transfer Patterns (LDTP) project was initiated by the CSU several years ago based on legislation intending to provide more standardization of transfer requirements across the system and simplify the process for students (SB 1785, Chapter 743 Statutes of 2004). The LDTP for each major discipline includes, in addition to the 39 units of GE and 6 units of American history and government, 3 to 6 units of lower-division major course work that is standardized across all CSU campuses. The remaining units of the 60-unit transfer curriculum consist of campus-specific lower-division major requirements or elective credits. There are currently LDTP statewide patterns for 44 major disciplines that account for 90 percent of transfers into CSU. Beginning in the spring of 2010, CCC students will be able to enter into an LDTP agreement up to the time they have completed 45 transferable units, and such students will be given "highest priority for admission" in the form of a written guarantee of admission to the particular CSU campus and major specified in the agreement.

The LDTP project provides a good example of how the segmental structure of higher education policy and planning can constrain efforts to improve the transfer process. It is a project of the CSU, which has made a substantial investment of time, effort, and resources over the past five years in formulating the program and developing the more standardized course patterns for each major. But some groups within the CCC have resisted the program over concerns that CCC faculty, articulation officers, and other interests were not involved in its development, and that revising community college courses to meet LDTP requirements could potentially jeopardize articulation agreements with UC and with private universities.[24] There are also concerns that some CSU campuses are not honoring the statewide LDTP pattern as fulfilling specific requirements in a major, that the LDTP course descriptors do not reflect the requirements of courses provided by CSU to its own students, that individual campuses are allowed to set unique requirements, and that LDTP does not help a student keep options open between UC and CSU.[25]

CSU is moving forward with LDTP, and is planning pilot efforts with two community colleges to match LDTP requirements with related associate degrees,[26] but it remains to be seen how widespread this transfer option will become once the LDTP agreements begin next spring. Even fully implemented, the LDTP program would leave students facing different lower-division major requirements across CSU campuses, and would do nothing for students wanting the option of transferring to a UC campus. This example illustrates how segmental, rather than statewide, efforts can fall short of the goal to better meet student needs, however well-intentioned.

Interest in Reform is Growing

Despite the challenges, there is growing awareness that California needs new tools and a new commitment to make transfer work better. Reports have documented the failure of the current transfer practices in California to provide a clear, straightforward and consistent pathway for students.[27] Frustrated transfer students in California have shared their stories of courses not transferring,

The Transfer Process Is Extremely Complex

Table 4
A Medley of Transfer Initiatives

Initiative	Description
Articulation System Stimulating Interinstitutional Student Transfer (ASSIST)	Online transfer information system that provides students and college staff with information on what courses at one community college or university can be transferred to a specific program at another college or university
California Articulation Number (CAN) System	A now-defunct course identification system that attempted to assign a common course number to lower-division, transferable, general education and major preparation courses in all three segments in order to facilitate transfer
Course Identification Number (C-ID) System	A recent effort of the community colleges, in cooperation with faculty at UC, CSU and private universities, to develop a course numbering system to facilitate articulation and help students identify equivalent courses; during the pilot phase, 2007-2009, course numbers are being developed in 20 disciplines that are among the most frequently transferred
Dual Admissions Program (DAP)	A program that offered high school students who fell between the top 4% and 12.5% of the graduating class a guarantee of admission to a specific UC campus after completing a CCC transfer program; the program was instituted in 2002-03 but was eliminated when the governor cut its funding in the 2004-05 budget
Integrated General Education Transfer Curriculum (IGETC)	A series of courses that represent one option for CCC students to satisfy lower-division GE requirements before transferring; primarily used by students planning to transfer to UC but also accepted at CSU
Intersegmental Major Preparation Articulated Curriculum (IMPAC)	An effort that brought discipline faculty from each segment together regionally to discuss the lower division major preparation course requirements for transfer
Lower-Division Transfer Patterns (LDTP)	An effort within CSU to develop standardized lower-division coursework required for transfer into the 44 most common majors across the 23 campuses, which provides individual campuses the right to set up to 15 units of unique local requirements
On-line Services for Curriculum and Articulation Review (OSCAR)	A web-based computer system for the submission, review, and archival of course outlines for CCC courses proposed for articulation with CSU and UC
SciGETC	A variation of the IGETC GE pattern more appropriate for students interested in transferring into majors requiring substantial lower-division math or science preparation; allows students to defer a course in Arts/Humanities and a course in Social/Behavioral Sciences until after transfer to allow for more math and science coursework at the CCC
Transfer Admission Guarantee (TAG)	Seven UC campuses offer guaranteed admission to CCC students who meet specific course and grade point average requirements and file formal TAG agreements; guaranteed admission is to a specific major at most campuses (some majors are excluded), but just to the campus at one university
Transfer Preparation Paths (TPP)	A new effort within UC to summarize the major preparation coursework required for transfer; Statewide and Campus paths summarize the requirements for similar majors across the UC campuses, and highlight the common requirements shared by a majority of campuses and the distinct requirements of specific campuses

having to repeat courses taken at a community college, and receiving inaccurate information from counselors and faculty at both the community college and university levels. Public decision makers' interest in the effectiveness of the transfer process is also motivated by reduced resources at the state level and a need to examine inefficiencies in the process including issues of time to degree, accumulation of unnecessary units, and rates of transfer and degree completion.

Recent legislative initiatives have sought to require the segments of higher education to adopt a range of solutions including common course numbering (SB 1415, Chapter 737, Statutes of 2004) and common lower-division major preparation curricula (SB 1785, Chapter 743 Statutes of 2004) in an effort to facilitate transfer. In the current legislative session, a bill under consideration would authorize community colleges to issue an associate degree in a major field of study designated as being "for transfer" to students who meet certain requirements (AB 440, Beall). The bill was intended to address the problem that many students transfer without earning an associate degree, because the coursework necessary to transfer differs from associate degree requirements. As of this writing, the bill is supported by the CCC Chancellor's Office and the League for California Community Colleges but opposed by the CCC Academic Senate, likely because it places degree requirements in statute that have traditionally been the prerogative of campus faculty.[28]

The three segments have sponsored or supported projects to provide greater clarity and support for students seeking to transfer, including some described in Table 4. The CCC Chancellor's Office, with support from The James Irvine Foundation, is currently sponsoring the Career and Technical Education (CTE) Transfer Research Project to assess the opportunities and challenges for students pursuing CTE coursework to transfer to a university. Most recently, the leaders of the three segments of higher education announced in February the formation of a joint task force to develop plans to increase transfer.[29] While to date these kinds of legislative and segmental efforts have yielded limited success, they demonstrate the growing recognition that something must be done to improve the transfer process.

Fortunately, California can learn from the efforts of other states that have struggled with the issue of how to increase the number of community college students successfully transferring and completing the baccalaureate. A number of states have implemented reforms in an effort to achieve that goal. In the next section, we describe the efforts of several states to achieve more standardization in the transfer process in order to improve transfer success, and discuss some common issues faced by those states in developing and implementing those processes.

Transfer Policies in Other States May Offer Lessons for California

Like California, many states use institution-to-institution articulation agreements to manage the process of transfer from community colleges to four-year institutions, along with websites and other efforts to disseminate information to students about the process. But in an effort to find approaches that are more effective in increasing transfer rates, some states are developing statewide approaches to transfer. Most recently, the Arkansas legislature passed House Bill 1357, the Roger Phillips Transfer Policy Act. The bill requires the Arkansas Higher Education Coordinating Board to develop a statewide transfer agreement by January 2010 to:

- designate the Associate of Arts, Associate of Science, and Associate of Arts in Teaching as transfer degrees
- require public universities to accept all credit hours for students completing an associate degree, and to give such students junior status and require no further lower-division GE courses
- require each public university to develop transfer guidelines for each community college within 50 miles (or, if none, the closest college), specifying the courses at that college that will prepare a student for each of its baccalaureate degree programs.

In developing this legislation, Arkansas is following the lead of other states that have turned to statewide structures in an effort to increase transfer success. To draw lessons for new reform efforts in California, we reviewed the transfer policies of eight states: Arizona, Florida, New Jersey, North Carolina, Ohio, Oregon, Texas, and Washington. We selected these states because they are known for having developed statewide approaches to transfer, because they have strong community college and public university relationships, or are viewed as being innovative in tackling student success issues in general. We began with an initial survey of university and system websites, which provided links to more extensive policy documents, curricular/catalog information, transfer guides for students, internal reviews and evaluations, and external national studies and assessments on broader transfer issues and state policy approaches to transfer.

The statewide policy approach in each of these states is different, but there are some common characteristics. Several of the states are using an associate transfer degree (or set of degrees) while others are using a common statewide general education curriculum without an associate degree. Within these two general approaches, some of the common characteristics are as follows:

1. Associate degree(s) for transfer (Arizona, Florida, New Jersey, North Carolina, Oregon, and Washington):
    - a statewide GE curriculum with specific unit requirements
    - guarantees of transfer and acceptance of completed units (all GE and the full 60-64 units) regardless of major or choice of institution
    - partial or total inclusion, within associate degree, of lower-division major prerequisites
    - minimal local "add on" options for four-year institutions (except in some specialized majors)
2. Standardized GE curriculum/major pathways (Ohio and Texas):
    - a core GE curriculum which sometimes permits "add ons" by individual universities
    - major pathways, transfer modules, transfer assurance guides, and direct transfer agreements used as vehicles for major preparation
    - some institutional differences in lower-division major preparation
    - statewide web sites and information systems.

While these characteristics generally describe the two approaches, each of the eight states we reviewed has taken a unique approach to developing and implementing more standardized statewide policies to facilitate transfer. Some states use both approaches; students can either complete a standardized GE core and have some assurances about transferability, or can complete additional requirements for an associate degree and have even more guarantees. Table 5 summarizes the approach in each of the states, including curricular design and mechanisms to provide transfer information to students.

Table 5
Summary of States' Approaches to Transfer

State	Policy Features
States with Associate Degrees for Transfer	
Arizona	■ Legislatively mandated task force developed the framework in 1996 ■ Arizona General Education Curriculum (AGEC) is a set of standardized GE patterns for different pathways: arts (AGEC-A), science (AGEC-S) and business (AGEC-B) ■ Transfer Pathways, including associate degrees, correspond with each AGEC option; 7 options depending on major discipline and certainty about choice of university ■ Completing AGEC guarantees admission (not to specific campus or major) and completion of GE ■ Completing a transfer associate degree (AGEC + Transfer Pathway) guarantees junior status, application of pathway credits to the major, and competitiveness for admission to programs ■ Arizona Transfer website guides students through the options
Florida	■ Legislation in 1971 established the associate degree as a transfer degree; all public universities and many private institutions recognize the degree ■ Any AA degree guarantees admission to a public university (not a specific campus or major), with junior standing for registration purposes ■ Degree includes 36 GE units and 24 elective units; no explicit requirement for major preparation, but students recommended to complete pre-major requirements and the degree is offered in concentrations that parallel BA programs at public universities ■ Traditional articulation agreements specify courses for major preparation ■ GE requirements vary across institutions, but completing GE at one college guarantees transfer of GE as a block ■ Statewide Course Numbering System (SCNS) used at all public institutions ■ Florida's Advising, Counseling, and Tracking for Students (FACTS) website includes transfer requirements, articulation information, and a degree audit system to compare transcript to degree requirements
New Jersey	■ New Jersey Comprehensive Statewide Transfer Agreement recently enacted (fall 2008) based on legislation passed in 2007 ■ Any AA/AS from a state community college receives full credit at a public university (60-64 units); some private universities establishing similar policies ■ Completion of AA/AS satisfies all GE but does not guarantee admission to a university ■ AA/AS will indicate that student has completed exactly half of the units required for BA/BS, unless a required major prerequisite course(s) is needed, which would increase the units required to complete the bachelor's degree ■ Students encouraged to complete AA/AS that aligns with their anticipated major ■ NJ Transfer website describes the statewide transfer agreement, degree requirements, and course equivalencies

Table 5 (continued)
Summary of States' Approaches to Transfer

State	Policy Features
States with Associate Degrees for Transfer	
North Carolina	■ Comprehensive Articulation Agreement (CAA) authorized by legislation in 1995 applies to all community colleges and public universities; 23 private universities also participate ■ Completion of CAA (44 semester units) guarantees transfer of the credits as a block and completion of GE, but not admission ■ Completing an AA/AS degree in addition to CAA guarantees admission to a public university (not a specific campus or major), transfer of all credits, and junior status for registration ■ AA/AS Pre-Major agreements in common majors require 64 units: 44 GE units and 20 units of major preparation and electives ■ Common course numbering across community colleges ■ No website specifically for transfer information, but it is included on the University of North Carolina website
Oregon	■ Joint Boards Articulation Commission developed transfer degrees in 1992 ■ Two transfer degrees: Associate of Arts/ Oregon Transfer (AA/OT) and Associate of Science Transfer in Business ■ AA/OT's 90 quarter units include 55 units of GE and 35 elective or lower division major units; 12 units of applied professional/technical coursework can be used as electives ■ Oregon Transfer Module (OTM) is embedded in the AA/OT; equivalent of one year of full-time study and offers an alternative for early transfer ■ AA/OT guarantees completion of GE, acceptance of all 90 units, junior standing for registration purposes but no assurance of standing in the major ■ Publications describe information for students, but no comprehensive website on transfer; Articulation Transfer Linked Audit System (ATLAS) is a degree audit system to compare transcript to degree requirements
Washington	■ Several transfer degree options: • Associate of Science - Transfer Degree (AS-T) • Direct Transfer Agreement Associate Degree (DTA) • Applied Associate of Science in Technology (for transfer to Bachelor of Applied Science) ■ DTA includes 60 quarter units of GE and 30 units of major courses and electives ■ 4 Major Related Programs (MRPs) for DTA in business/accounting, elementary education, pre-nursing, and math education; several MRPs for AS-T in engineering and other science fields ■ Completing degree gives priority consideration in admission to public universities ■ No comprehensive website for transfer information at this point, but an Academic Guidance and Planning System (Academic GPS) is under development

Table 5 (continued)
Summary of States' Approaches to Transfer

State	Policy Features
States with Standardized GE Curriculum but Not Transfer Associate Degrees:	
Ohio	■ Ohio Articulation and Transfer Policy revised and adopted by the Ohio Board of Regents in March 2007 ■ Ohio Transfer Modules (OTMs) outline GE requirements (36-40 semester units); adapted by each institution so there is a need for complex course equivalency systems; no statewide transfer module ■ Transfer Assurance Guides (TAGs) in 8 disciplinary areas describe major preparation coursework and course equivalencies across institutions ■ Completing TAG courses guarantees that courses will transfer and apply to degree requirements ■ Completing OTM and TAG courses does not guarantee admission ■ Website of the Board of Regents includes a section on Credit Transfer that describes OTMs and TAGs
Texas	■ Legislature mandated statewide core curriculum in 1987 for all public institutions ■ Core includes 36 semester units of GE and additional units for field of study curriculum (FOSC) or electives ■ 11 FOSC offered in high demand majors ■ Institutions may add requirements to the core ■ Completing the core GE and FOSC guarantees acceptance of all units; no guarantee of admission to a major or university ■ Only the new Associate of Arts in Teaching is a degree designed specifically for transfer ■ Common course numbering for lower-division courses across all public institutions ■ College for All Texans website provides some guidance on transfer, but there is no comprehensive transfer website

Transfer Policies in Other States May Offer Lessons for California

Some Positive Outcomes Are Being Documented

While only limited information is available about how well the statewide transfer approaches described here are working, several of the states we examined have conducted evaluations of their policies:

Florida: A recent report of analyses conducted using Florida's comprehensive student data indicated that the admission rate to state universities is higher for students with an AA degree than for freshman applicants (76% vs 57%), and that AA transfers in public universities graduate with a similar number of total credits as native freshmen, at 138 and 135, respectively.[30]

Arizona: A 2007 study of Arizona's transfer policies concluded that policy changes had resulted in transfer students completing the bachelor's degree with nearly one semester less credit than was the case five years earlier.[31] The study found that students transferring after meeting AGEC requirements (with or without completing an associate degree) were more likely to graduate within a specified time period than students transferring with community college credits but without having followed a specified transfer pathway, and those completing AGEC graduated with fewer total credits.

Washington: In an evaluation of its Associate of Science Transfer degree, which is intended to provide a better pathway to transfer for the sciences and engineering, Washington found that students earning the AS-T transfer to a university at a higher rate, complete fewer credits to degree, and are more likely to earn a bachelor's degree than students who follow the more general Direct Transfer Agreement with a science-related concentration.[32] Also, the 3-year graduation rate for students transferring to a Washington public university with an associate degree has improved from 63% in the late 1990s to 71% in 2006-07,[33] perhaps indicating that the state's work on major pathways is helping transfer students arrive prepared to complete baccalaureate degree requirements more efficiently.

North Carolina: Data from North Carolina indicate that the number of transfers from community colleges to public universities as a percentage of community college FTE enrollment in credit courses has increased in recent years, from 15 percent in 2000 to nearly 25 percent in 2007.[34]

Comparative data and methods do not exist to draw any conclusions across states as to the effectiveness of these new degree/pathway approaches to transfer. This is in part because these policies are new but mostly because, as noted earlier (see endnote 5), there are no meaningful measures of transfer rates that are common across states.

Common Issues Arise in States' Transfer Reform Efforts

The states we examined confronted similar issues in designing their transfer processes, including:

- what organization or structure should be used to develop and administer a statewide approach to the transfer process
- how much standardization in transfer requirements and curriculum should be imposed across the state's higher education system
- whether and how lower division major preparation requirements should be integrated with a standardized GE curriculum
- when transfer students should be required to declare a major, and how best to provide related support services
- how to encourage students to transfer and earn degrees in majors related to high-priority state needs
- how to design advising tools and services to help students understand and navigate the transfer process.

Policy Development and Administration

The first requirement for any major statewide reform in the transfer process is having some organization or structural framework from which to develop and implement such policy change. Many of the states we reviewed used an intersegmental transfer and articulation commission or task force to develop strategies for improving the transfer process, with legislation formalizing the statewide transfer structures and processes. Most frequently these bodies are linked to higher education coordinating boards or governing

boards and frequently include as members administrative and faculty leadership in the system(s). Some commissions are administratively housed in one of the university systems and have taken the lead in periodic evaluations or studies of the effectiveness of the process.

Standardization across the System

The degree of uniformity of the transfer curriculum, in terms of both GE curriculum and major preparation, varies across the states. Florida is an example of a more uniform approach, with completion of any associate of arts degree offering a guarantee of admission to a public university at the junior level (at least for registration purposes). Florida's centralized governance for higher education may help the state maintain such a standardized transfer model, although the transfer policies pre-date the adoption of a single Board of Governors for all of higher education.[35] Other states have achieved substantial standardization without having centralized governance. Arizona has achieved agreement on shared structures in general education, associate degrees, major pathways, and a statewide advising/student information system despite having entirely local governance of its seventeen community colleges (a single Board of Regents governs the three public universities).[36] The Texas legislature mandates a core GE curriculum despite its complex governing structure: there are six governing boards for the public universities and 50 local boards for the community colleges. The state does have a strong coordinating board that pushed for the standardized GE curriculum.

Integrating GE and Major Preparation

States using standardized approaches to transfer are recognizing the importance of integrating major preparation and GE curricula. Associate degrees or statewide transfer patterns that involve a common GE curriculum combined with elective credits can leave students with upper division registration status but no admissibility to a major at the four-year institution. Or, if admitted, students may be left with substantial pre-major lower division coursework to complete and "excess" units from the community college for the elective courses that do not contribute to the requirements for completing the baccalaureate in a particular major.

The special need of math and science majors for extensive lower-division coursework in those subjects presents a particular problem. Some states are responding to this need by providing an alternative GE curriculum for students interested in transferring in math and science fields. Arizona's AGEC-S requires fewer units in the humanities and social/behavioral sciences, and leaves more room for additional math and science courses as preparation for the major. Washington's AS-T includes only 45 quarter units of GE (compared to 60 for the DTA) to allow more room for major preparation, with additional GE coursework required at the university after transfer. Washington has also developed Major Related Programs (MRPs) to make clear the lower-division major requirements for fields where demand is high and where transfer students typically have had to earn excessive units at the university to make up for under-preparation at the time of transfer.[37] Oregon is currently engaged in an assessment of the Associate of Arts/Oregon Transfer (AA/OT) degree, and is considering establishing an Associate of Science degree (AS/OT) with more limited GE requirements for math and science majors.

Declaring a Major and Related Support Needs

As part of the effort to address major preparation and limit excess units, states must grapple with how directive to be in requiring major declaration early in the community college experience and how rigidly to enforce such choices. Florida and Arizona recommend in their advising literature that students declare a major at 24 units, and Florida is reportedly considering making this a requirement. Other states post guidelines and "to do" lists for transfer students, which recommend selection of a major by the end of the first year in community college.

Oregon has developed a different strategy to address the problem of students completing a full half of their baccalaureate unit requirement without adequate lower-division major preparation. The Oregon Transfer Module (OTM) is designed for the significant number of students who transfer before obtaining the AA/OT degree, offering a shorter (in terms of units) but still definable curricular pattern for those who choose to transfer after one year at a community college. Oregon has found that more than half of their students transfer without the AA/OT and with a more random collection of courses, too many of which are

unrelated to major preparation. The OTM avoids the issue of requiring major declaration at the community college by allowing students to enter a university as a sophomore while there is still time to complete major preparation coursework while in lower-division status.

Targeting High-Need Majors

Some states are developing statewide associate degrees for transfer that focus on high-demand fields of study to meet specific workforce needs. Arizona and Oregon have developed degrees that focus on business, elementary education, nursing, and engineering technology. Related to this targeting for high needs is the move to encourage development of Associate of Applied Science (AAS) degrees that are transferable to universities within the state that offer the Bachelor of Applied Science (BAS), an approach being implemented in Arizona. Oregon permits 12 units of applied professional/technical coursework completed at a community college to be accepted as electives upon transfer. The Ohio legislature has recently required a process for linking career technical courses to Transfer Assurance Guides (notably in applied science and business).

Developing Advising Tools and Services

Multiple paths to transfer require clear communication to students who must choose among the options and make appropriate course-taking decisions. States are increasingly giving attention to websites with interactive elements to support their transfer strategies, allowing students to more easily plan their academic studies. One of the goals is to build more confidence and credibility in the self-counseling process, in light of declining resources to fund student support services.

While developing better websites and other advising tools can help students navigate a complex transfer process, an alternative approach would focus on simplifying the process enough to reduce the information burden on students. Research comparing the approaches of private occupational colleges to those of community colleges found that some private colleges were able to achieve higher completion rates by having simple, clear pathways to a credential and assuming greater responsibility for informing students, guiding their choices, and preventing mistakes through frequent mandatory advising.[38] To the extent that the transfer process is standardized and simplified, the need for informational tools to navigate a complex process is reduced.

Options and Recommendations for California

State Examples Point to Several Models

The state policies we examined in the last section, along with the issues the states have confronted in designing their transfer policies, point to several alternative models to consider in developing a more standardized, statewide approach to transfer policy in California.

1. ***Associate degrees designed for transfer, including a core GE curriculum and defined major preparation pathways***

   Associate degrees would be offered at community colleges in general/transfer studies and in either specific majors (e.g., accounting, biology, political science) or in broader discipline areas (e.g., business, science, social science). Completion of an associate degree in general/transfer studies would guarantee transfer of all degree credits and admission to a public university (but not to a specific campus, or in a specific major or with upper division status). Whether the guarantee of admission would be to UC or CSU would depend upon student academic performance (GPA) as it does under current policy. Completion of an associate degree in a major discipline would likewise guarantee admission and transfer of all degree credits and would *additionally* guarantee eligibility for junior status in a related major. Development of associate transfer degrees would not preclude the awarding by the CCC of non-transfer, terminal associate degrees or applied associate degrees.

2. ***A statewide GE curriculum combined with major preparation pathways, but no transfer associate degrees***

   A standardized GE pattern would be developed and applied across all public colleges and universities. All GE credits would transfer to all public institutions. Standardized major preparation pathways would specify lower-division requirements for each major/discipline with allowance for minor variation across institutions. Completion of both GE and major pathway courses would guarantee transfer of all credits and eligibility for junior status in a related major to those public universities whose pathways were followed, if admitted. Admission to a public university would not be guaranteed (a key difference from the first alternative) but students would receive some priority in admission.

3. ***A statewide GE curriculum for early transfer to a university with lower-division status***

   A standardized GE pattern would be developed and applied across all public colleges and universities, and students would be guaranteed transfer to a public university as sophomores and acceptance of GE credits. Major preparation would be completed after transfer while still in lower-division status.

The models are not mutually exclusive. For example, Oregon has two transfer associate degrees (AA/OT and AS for Transfer in Business), but also offers students the option of completing one year of GE requirements in the Oregon Transfer Module followed by enrollment in a university as a sophomore. Community college students in North Carolina can complete the core requirements in the state's Comprehensive Articulation Agreement and be guaranteed completion of GE if they transfer at that point, but students who also complete an AA/AS degree have a further guarantee of admission to a public university and junior status.

New Transfer Policy Should Meet Several Criteria

Several criteria should guide any choice among alternative models for improving transfer. Above all, the process should be designed to help students move efficiently through their degree programs, yielding more college-educated workers for the state's economy. Specifically, reforms should result in a process that is:

- *Effective* in creating pathways that lead to more community college students transferring to universities and earning bachelor's degrees
- *Efficient* in minimizing the number of unnecessary credits students earn on the path to a degree
- *Transparent* and easy to understand for students, families, and counselors
- *Robust* in accommodating the requirements of multiple major programs
- *Strategic* in targeting majors that meet high-priority state needs
- *Feasible* in balancing stakeholder desires for change with institutional interest in setting standards and requirements for transfer.

Options and Recommendations for California

Table 6 presents our attempt to evaluate how well each of the three alternative policy approaches satisfies these criteria (high, medium, or low), given what we know about California's higher education system and its political and policy environment.

Table 6
Analysis of Three Alternative Models for Student-Centered Transfer

Associate Degrees for Transfer		
Criteria	**Rating**	
Effective	High	+ Provides clearer pathway to transfer + Aligning associate degree requirements in various fields with BA/BS lower-division requirements would prepare students for transfer into majors + Research suggests students who earn associate degree before transfer are more likely to complete BA/BS[39] + The guarantee of admission (with minimum GPA) would provide a strong incentive for students to choose the associate degree option + Students who don't transfer or transfer but don't finish the BA/BS at least end up with an associate degree for their (and the state's) investment
Efficient	Medium	+ Would minimize excess units by standardizing curriculum across institutions within each substantive associate degree – Inadequate advising resources could limit the positive impact on reducing excess units
Transparent	High	+ Having standardized lower-division requirements within a major (or groups of majors) would make the process simpler for students and advisors + Having the same requirements for both transfer associate degrees and for transfer in most subject areas would eliminate much confusion for students and the general public about transfer and the role of the "two-year" sector
Robust	High	+ There would be a transfer associate degree appropriate for every major – some with specialized degrees and the others under a general transfer associate degree
Strategic	Medium	+ Could target associate degrees at areas of high need – Students who receive inadequate early advising about major preparation may choose majors with few pre-major requirements rather than those of higher need and value
Feasible	Medium/Low	+ Would increase degree completion in the CCC, to the benefit of their accountability reporting + Should be appealing to governor and external stakeholders (e.g., business) who favor increased efficiency and degree completion – CCC faculty, who now control associate degree requirements, would have to conform to UC/CSU transfer requirements or gain agreement with UC/CSU faculty on new requirements – Challenge for some majors in fitting adequate GE and pre-major preparation into a 60-unit associate degree – Getting cross-segment faculty approval of standardized lower-division requirements for each discipline could be difficult

Table 6 (continued)
Analysis of Three Alternative Models for Student-Centered Transfer

GE Core + Major Pathways		
Criteria	**Rating**	
Effective	Medium	+ Provides clearer pathway to transfer in specific majors, but those pathways are only clearer for students who decide early where they want to transfer – Many students who transfer but don't complete BA/BS have no college credential
Efficient	Medium	+ Could minimize excess units if requirements for transfer into majors are more standardized across the system – Is more dependent than the transfer degrees alternative on accurate advising in order to minimize excess units
Transparent	Medium	+ To the extent that lower-division major requirements are standardized across universities, it would simplify process for students – There may be more pathways for students to consider than under the associate degrees alternative, placing a higher burden on students to understand their choices
Robust	High	+ Pathways could be developed for at least the most highly enrolled majors at the public universities
Strategic	Medium	+ Could target major pathways at areas of high need – Students who receive inadequate early advising about major preparation may choose majors with few pre-major requirements rather than those of higher need and value
Feasible	Medium	+ CSU/UC faculty have already worked on LDTP and TPP, offering a starting place for pathway development + Should be appealing to governor and external stakeholders (e.g., business) who favor increased efficiency – History of resentment in CCC over LDTP process may serve as barrier to new efforts – Getting cross-segment faculty approval of more standardized requirements for each discipline could be difficult
GE Core with Early Transfer		
Criteria	**Rating**	
Effective	High	+ Provides straightforward pathway to transfer + Research shows students in 4-year institutions more likely to complete BA than similar students with BA intentions in 2-year institutions,[40] so getting students to a university earlier may increase the likelihood of completion
Efficient	Medium	+ Greater likelihood of completing BA/BS would increase efficiency – Moving to university after one year in CCC would result in greater costs to the student and the state for the sophomore year
Transparent	Medium	+ A one-year GE core for transfer could be simpler for students and advisors than two-year program with major pathways – It could be confusing for students and advisors to know under what circumstances this option is preferable to transferring as a junior
Robust	High	+ One-year GE core would easily transfer into most majors
Strategic	Medium	– One-year GE core is not targeted at particular majors + Earlier transfer could allow more students to get on a path to high-priority majors at the university
Feasible	Low	– Master Plan tradition emphasizes transfer occurring after completion of 60 units (and meeting academic criteria) – CCC would fear loss of enrollment with students transferring out earlier – UC/CSU may resist idea of transfer after only one year at CCC due to limited enrollment capacity – Would not be supported by political leaders in this economic environment

Options and Recommendations for California

Recommendations

The success other states have had in making their transfer policies more student-centered, and the evaluation of the alternative models against important criteria, suggest that efforts to improve California's complex transfer process could yield benefits in increased transfer rates and more degree completion. With so many underprepared and first-generation students in the California Community Colleges, the adoption of simpler, student-centered policies would seem to hold promise for increasing rates of transfer and baccalaureate degree completion.

We recommend that the Legislature enact legislation that:

- Directs the CCC to develop associate degrees for transfer, working with UC and CSU, and designates that the completion of such a degree entitles students to admission to a public university and to guaranteed transfer of all degree credits (criteria related to GPA would determine whether guarantee is to UC or CSU; no guarantee of specific campus)
- Directs that CCC and CSU, and requests that UC, work together to develop standardized GE and major preparation requirements across the segments for a set of common majors to serve as requirements both for an associate degree for transfer in that field and transfer into that major, with minimal variations across institutions within majors
- Specifies that students completing an associate degree for transfer with major preparation are to be guaranteed junior status upon admission, with UC/CSU able to require additional lower-division major preparation *after* transfer if necessary in particular disciplines
- Requires the development of a degree audit system to allow counselors and students to determine how the courses they have completed match up to requirements for degrees/transfer, and to allow the CCC to automatically issue associate degrees to students who have completed all requirements
- Specifies that the development of associate degrees for transfer does not preclude the awarding by the CCC of non-transfer, terminal associate degrees or applied associate degrees.

Standardizing transfer requirements across the university systems, and ensuring that the requirements for associate degrees for transfer at the CCC match those requirements, could help to increase rates of transfer and degree completion. Complete standardization of transfer requirements is likely impossible and unnecessary, but as has been demonstrated by other progressive states, compromises can be found that help students by taking reasonable steps towards greater standardization.

As noted earlier, the state's segmental approach to policy and planning, its emphasis on local autonomy, and its strong tradition of faculty governance of academic issues offer particular challenges to developing and implementing statewide transfer policies. While decentralized structures have not prevented other states from implementing more standardization, the size of California's higher education system, the breadth of programs offered in its colleges and universities, and the diversity of the communities and students served make the task a particularly difficult one. In addition, the tendency of executive branch leadership to focus on K-12 rather than postsecondary issues, the dearth of legislative leadership owing to term limits, and the relatively weak coordinating role of the California Postsecondary Education Commission have so far prevented comprehensive action to adopt student-centered transfer policies.

Some developments that could more closely align the interests of colleges and universities with the interests of students in having seamless transfer are the growing emphasis on accountability and the trend toward funding institutions in part for performance instead of solely for enrollment. Several states have adopted, or are actively considering, revisions to their funding formulas to reward institutions for completions of courses, degrees, or some threshold of student progress.[41] A transfer process built around transfer associate degrees and aligned curriculum across institutions would increase measurable performance within the CCC in a number of areas: number of associate degrees awarded, the graduation rate, the number of transfers, and the transfer rate. It would also likely increase the graduation

rate of transfer students at UC and CSU and reduce the units to degree taken by transfer students who earn bachelor's degrees. As pressure mounts to account for student success, opposition to a statewide approach to transfer may subside.

Even with a confluence of interests around student success, reshaping transfer in California will not be easy. However, it will be a test of a collective commitment to California's students and its future that must be passed. The consequences of business as usual approaches to transfer, and to transfer reform, are untenable.

Endnotes

[1] Reed, D. (2008). *California's future workforce: Will there be enough college graduates?* San Francisco: Public Policy Institute of California

[2] Johnson, H. & Reed, D. (2007). *Can California import enough college graduates to meet workforce needs?* San Francisco: Public Policy Institute of California

[3] Johnson, H. & Sengupta, R. (2009). *Closing the gap: Meeting California's need for college graduates.* San Francisco: Public Policy Institute of California

[4] California Postsecondary Education Commission, Custom Data Report for Enrollment—Full-year Transfers to Public Institutions, 2008

[5] Roach, R. (2009, May 14). The community college transfer problem. Diverse Online (www,diverseeducation.com). While many states are working to raise their transfer rate, there is no accurate way to compare transfer rates across states. The most comparable data is for first time, full-time students but that represents a small portion of the community college enrollment in most states. Further, states use a variety of definitions for determining "intent to transfer," which determines the denominator of a transfer rate computation. Even the notion of a "transfer" can vary widely across states because of different state policies for when students can, or are encouraged to, transfer.

[6] Sengupta, R. & Jepsen, C. (2006). *California's community college students*. San Francisco: Public Policy Institute of California; Shulock, N. & Moore, C. (2007). *Rules of the game: How state policy creates barriers to degree completion and impedes student success in the California Community Colleges*. Sacramento, CA: Institute for Higher Education Leadership & Policy; California Postsecondary Education Commission (2007). *California higher education accountability: Goals –student success, measure: California Community College students' degrees and certificates awarded and successful transfers*. Sacramento, CA: Author; Driscoll, A.K. (2007). *Beyond access: How the first semester matters for community college students' aspirations and persistence* (Policy Brief 07-2). Berkeley, CA: Policy Analysis for California Education; Horn, L. & Lew, S. (2007). *California community college transfer rates: Who is counted makes a difference.* Berkeley, CA: MRP Associates, Inc.; California Community Colleges Chancellor's Office (2009). *Focus on results: Accountability reporting for the California community colleges*. Sacramento, CA: Author.

[7] The study was conducted in about 2003-04, and involved reviewing the transcripts of nearly 2,000 transfer students who graduated from CSU in 1999. A summary of the findings can be seen in a 2004 document of the Academic Senate at http://rhet.csustan.edu/aa/docs/QAfor45-15.pdf.

[8] Horn, L. & Lew. S. (2007). *Unexpected pathways: Transfer patterns of California community college students*. Berkeley, CA: MPR Associates, Inc.

[9] Many CCC students enter college unprepared for college-level coursework, and must take basic skills in English and/or math. These courses carry "credit" but not credit that is applicable to a certificate or degree, and the credit is not transferable to a university. These basic skills credits were not counted in these studies of "excess units."

[10] University of California Office of the President (2005). *California Performance Review – ETV 15 – Unit accumulation at transfer study: Phase I results: Student focus groups*. Oakland, CA: Author.

[11] The cohort represents all first-time CCC students in 2000-01, tracked over 7 years. The data were provided to us by the California Community Colleges Chancellor's Office.

[12] The average graduation rate for students attending universities that are members of the Association for Independent California Colleges and Universities are generally higher than for CSU students and comparable to UC students (see http://www.aiccu.edu/images/stories/aiccu/pdf_docs/wip2may08.pdf and http://www.aiccu.edu/images/stories/aiccu/pdf_docs/wip2jan09.pdf).

[13] The California Postsecondary Education Commission shows a summary of graduation rates for full-time freshmen enrolled in public and private universities in California at http://www.cpec.ca.gov/StudentData/GradRates.asp. The rates are those calculated by the National Center for Education Statistics. The University of Phoenix, one of the institutions enrolling growing numbers of CCC transfer students, has a 6-year graduation rate of first-time, full-time freshmen of less than 5%. See also, Loonin, D. & Devanthery, J. (2005). *Making the numbers count: Why proprietary school performance data doesn't add up and what can be done about it*. Boston, MA: National Consumer Law Center.

[14] See the UC Statfinder at http://statfinder.ucop.edu/

[15] See the Consortium for Student Retention Data Exchange graduation rates at http://www.asd.calstate.edu/csrde/index.shtml

[16] Direct comparisons of graduation rates of university freshmen and transfer students are not appropriate because transfer students have already completed up to 2 years of coursework at the time of enrollment in a university. A CSU study that "equalized" freshmen and transfers enrolled in the system found that graduation rates for the two groups are very similar (notes on the study are available at http://www.asd.calstate.edu/csrde/index.shtml#ftf).

[17] Among all students who transferred in the 2000-01 CCC cohort we examined, only 20% had earned an associate degree.

[18] Moore, C. & Shulock, N. (2009). *The grades are in – 2008*. Sacramento, CA: Institute for Higher Education Leadership & Policy

[19] Offenstein, J. & Shulock, N. (2009). *Community college student outcomes: Limitations of the Integrated Postsecondary Education Data System (IPEDS) and recommendations for improvement*. Sacramento, CA: Institute for Higher Education Leadership & Policy.

[20] Shulock, N. (2004). *On the durability of the Master Plan in the 21st century, or "If it's breaking, why isn't anyone fixing it?"* Sacramento, CA: Institute for Higher Education Leadership & Policy.

[21] Woodlief, B., Thomas, C., & Orozco, G. (2003). *California's gold: Claiming the promise of diversity in our colleges*. Oakland, CA: California Tomorrow.

[22] An "impacted" major at UC or CSU is one that receives more applications during the initial filing period from fully eligible students than there are spaces in that major, leading to the imposition of supplementary admission criteria.

[23] Retrieved from each campus website, July 28, 2009

[24] As an example of CCC concerns, see the Articulation Newsbrief for May-June 2007 at http://www.sdmesa.sdccd.cc.ca.us/articulation/pdf/NewsBriefMay-June07.pdf

[25] Personal communication with staff working on transfer issues in the CCC Chancellor's Office

[26] Redden, E. (2009). Finding the 'perfect 60' for transfer. *Inside Higher Ed*, March 21.

[27] Sengupta and Jepsen, 2006; Shulock and Moore, 2007; California Postsecondary Education Commission, 2007

[28] Senate Committee analysis of AB 440, as amended July 2, 2009 and AB 440 Factsheet: http://www.collegecampaign.org/assets/docs/AB-440-Fact-Sheet-07-14-09.pdf.

[29] See *UC, CSU, Community College Leaders Announce Joint Effort to Boost Transfer to 4-Year Institutions* at http://www.calstate.edu/PA/news/2009/csu_uc_transfers.shtml

[30] The Florida College System (2009). Statewide articulation agreement – effective and comprehensive. Zoom newsletter (Edition 2009-01, April).

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[32] Washington Higher Education Coordinating Board (2006). *Consolidated transfer report: Transfer policy and upper-division baccalaureate capacity*. Olympia, WA: Author.

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[34] Data gathered from the University of North Carolina system's *Statistical Abstract* for 2000-01 and 2007-08. The data presented do not represent a "transfer rate", which would involve observing the transfer behavior of individual students tracked over time.

[35] Until 2000, Florida had a segmental governance structure for higher education, with a statewide governing board for the four-year institutions and a coordinating board and local governing boards for the community colleges.

[36] The recently reinstituted Arizona Community College Council provides a platform for the districts to meet and discuss the needs of community colleges and the role the colleges can play in educating Arizona residents. The duties of the Council include providing recommendations for governance of the community college system and establishing statewide goals and performance measures for the system.

[37] Washington Higher Education Coordinating Board, 2009

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[41] Arizona, Indiana, Ohio, Texas, and Washington are among those states implementing or debating funding formula changes.

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