The Honorable Denise Moreno Ducheny  
Chair, Joint Legislative Budget Committee  
State Capitol, Room 5035  
Sacramento, California 95814  

Dear Senator Ducheny:

Pursuant to Item 6440-001-0001, Provision 9, of the 2008 Budget Act, enclosed is the University of California’s annual Report on the Science and Math Teacher Initiative.

If you have any questions regarding this report, Associate Vice President Obley will be pleased to speak with you. She can be reached by telephone at (510) 987-9112, or by e-mail at Debora.Obley@ucop.edu.

Sincerely,

Mark G. Yudof  
President

Enclosure

cc:  The Honorable Gloria Romero, Chair  
Senate Budget and Fiscal Review Subcommittee #1  
   (Attn: Ms. Amy Supinger)  
   (Attn: Ms. Cheryl Black)  
The Honorable, Wilmer Amina Carter, Chair  
Assembly Budget Subcommittee #2  
   (Attn: Sara Bachez)  
   (Attn: Amy Rutschow)  
Mr. Mac Taylor, Legislative Analysts  
Mr. Mike Genest, Director of Finance  
Mr. Dotson Wilson, Chief Clerk of the Assembly  
Mr. Gregory Schmidt, Secretary of the Senate  
Ms. Diane Boyer-Vine, Legislative Counsel  
Ms. Sara Swan, Department of Finance  
Mr. Steve Boilard, Legislative Analyst’s Office  
Joint Legislative Budget Committee (18)  
Interim Provost and Executive Vice President Robert Grey  
Executive Vice President Katherine N. Lapp  
Interim Senior Vice President Daniel Dooley  
Vice President Patrick Lenz  
Vice President Judy Sakaki  
Associate Vice President and Director Steve Juarez  
Associate Vice President Debora Obley
UNIVERSITY OF CALIFORNIA
Report on the Science and Math Teacher Initiative
(CalTeach)

2008-09 Legislative Session
UNIVERSITY OF CALIFORNIA

Report on the Science and Math Teacher Initiative

(CalTeach)

The following report is forwarded in compliance with Item 6440-001-0001, provision 9, of the 2008 Budget Act, which states:

The University of California (UC) shall report to the Legislature and the Governor by February 1 of each year on its progress toward increasing the quality and supply of science and mathematics teachers resulting from implementation of the Science and Math Teacher Initiative. This report shall include the following information: (a) annual number of mathematics and science teachers awarded credentials (by each UC campus) beginning with the 2004–05 academic year (before the State first provided funding for the initiative), (b) an expenditure plan on the use of the funds appropriated in this item, (c) the effectiveness of the initiative’s different components and activities, including an identification of best practices, and (d) the job placement of students who earn a mathematics or science teaching credential, including the location of the K–12 school of employment and whether it is in an urban, rural, or suburban setting.

Executive Summary

• **California faces a serious deficit in supply of well-qualified K-12 mathematics and science teachers.** State teacher workforce data analyzed by the California Council on Science and Technology (CCST) and the Center for the Future of Teaching and Learning (CFTL) indicate that more than 10 percent of all math and science teachers in California are underprepared. Given impending teacher retirements and growth of the K-12 population, one-third of students in the next five years will find themselves in classrooms without a qualified math or science teacher.

• **The University of California is helping to address this very important educational need through a dedicated effort to enlarge the pool of individuals appropriately prepared to teach in these disciplines.** Under the Science and Mathematics Initiative – known on campuses and by students as CalTeach – UC is recruiting mathematics and science majors into a program that provides special coursework and field experiences in K-12 schools to encourage them to pursue a career in teaching. Many CalTeach students take advantage of new minors or concentrations that focus specifically on math and science teaching. This focus complements work in their major to ensure both deep subject matter content knowledge and strong pedagogical skills.

• **Essential program components of CalTeach common to all UC campuses** are recruitment and advising; coherent curriculum (four-level sequence); field experiences in K-12 classrooms; research experiences; professional conferences, community building and other activities to create continuity; faculty collaboration among science, math, and education departments; participation by K-12 mentor teachers; ongoing systemwide data collection, research and evaluation; partnerships with K-12, community colleges and CSU; and financial incentives for students and stipends for mentor teachers.

• **To date, 1,891 students have participated in CalTeach,** with participation defined as successful completion of at least one of the seminars connected with early K-12 classroom field experiences. In addition, to date these students have worked with a total of 521 mentor teachers in 419 schools.
• UC continues to build and strengthen partnerships with California Community Colleges for recruitment of math and science students into the teacher pipeline. This work centers on duplicating the content of signature CalTeach courses at community colleges, providing equivalent transfer credit for participants, and offering students field placements in K-12 schools. During the current and coming academic years, UC will expand these efforts with new activities in the northern and southern regions of the state.

• Using current data as well as enrollment projections for community college and "native" CalTeach students, it appears UC in 2010-11 will be close to meeting its goal to increase to 1,000 the annual number of UC graduates who become math or science teachers.

• As a complement to this numerical target, the University is building a comprehensive system for measuring the quality of CalTeach graduates. This effort will feed into program improvement and will contribute to the State’s information store on teacher preparation and quality.

• The program has not yet completed its first full four-year cycle for students who entered CalTeach as freshmen in 2006 when courses began. Preliminary data on the initial four-year cohort will be available following a participant survey planned for 2010. UC will verify this information the following year upon release of statewide credential data from the California Commission on Teacher Credentialing (CTC). Though costly and sometimes difficult to collect, other outcome data such as job placement statistics are important. The University would like to secure this type of information as CalTeach graduates move from credential programs to the workforce.

• This report includes items requested in the 2008 Budget Act, including effectiveness of program components and information on expenditures. The total cost of CalTeach systemwide in 2008-09 is estimated at approximately $7 million. Of that total, $1,125,000 was provided by the State.

• Having completed its third year, CalTeach has evolved successfully through the formative stages of program development, initial implementation and early enrollment growth. It continues now in an intermediate phase of program expansion. Moving ahead, CalTeach will require a solid fiscal base. Plans for a new business or sustainability model are now underway to address fiscal challenges. These challenges consist of diminishing systemwide resources available for program oversight and excess demand on funds that support stipends for mentor teachers and financial incentives for students.

California’s Challenge in the Math and Science Teacher Workforce
The California Council on Science and Technology (CCST) and the Center for the Future of Teaching and Learning (CFTL) joined many other state, federal, and private sector experts more than a year ago in drawing attention to California’s alarming lack of well-qualified K-12 teachers in science and mathematics. CCST and CFTL analyzed data on the State’s teacher workforce and found that greater than ten percent of all math and science teachers in California are underprepared; that is, they lack the training and experience necessary for a teaching credential in their subject area. In addition, more than one-third are novice teachers in their first or second year. Attrition and retirement are further eroding the base of the science and math teaching force. Without prompt action, the State will experience as much as a 30 percent shortfall in qualified math and science teachers within the next five years. One of every three students will find themselves in classrooms without a qualified math/science teacher.

For California to remain competitive, especially in the industries that drive our State’s economic growth, its educational institutions—from K-12 schools through graduate programs—need to work together. They must collectively develop a workforce with the knowledge and skills required by an economy becoming increasingly reliant on science, engineering and mathematics. Highly qualified teachers are a linchpin in this process.
How to Meet this Critical Need — The Strategic Essentials

In order to raise the number of well-qualified teachers, California must:

1) Recruit a much larger number of talented, creative students to see teaching as an attractive field;
2) Expand the capacity of the State’s teacher preparation programs to accommodate these students; and
3) Strengthen the quality of teacher preparation programs to assure deep subject matter content knowledge and strong pedagogical skills.

These three elements make up the essential priorities identified by the CCST, the CFTL, and other authorities for building a larger and more expert math and science teacher corps for California’s schools.

The University of California CalTeach Program

Background

In May 2004, Governor Arnold Schwarzenegger took action on the math/science teacher shortage. He entered into an agreement with the University to provide resources to address the shortage. UC committed itself to the three strategic goals noted above and to helping the State meet workforce needs for math and science teachers.

Traditionally, UC has not been considered a significant contributor to the overall teacher supply. The annual CCTC report “Teacher Supply in California: A Report to the Legislature: Annual Report 2006-07” provides the following data:


<table>
<thead>
<tr>
<th></th>
<th>UC</th>
<th>CSU</th>
<th>PRIVATE/INDEPENDENT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credentials</td>
<td>1,005</td>
<td>10,840</td>
<td>8,463</td>
<td>20,308</td>
</tr>
<tr>
<td>% of Total</td>
<td>5%</td>
<td>53%</td>
<td>42%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: California Commission on Teacher Credentialing.

However, when looking at single subject mathematics and science credentials—in particular the baccalaureate institution of graduates who go on to secure teaching credentials in these disciplines—a very different picture emerges. The table below illustrates the University’s substantial contribution to the pool of math and science teachers for the State. **Specifically, UC educates a major proportion of individuals earning math credentials and, according to the most recent data available, more individuals earning science credentials than any other system or group.**

**DISPLAY 2: Single-subject Credentials Earned by Baccalaureate Institution of Candidates, 2006-07**

<table>
<thead>
<tr>
<th></th>
<th>UC</th>
<th>CSU</th>
<th>OUT-OF-STATE</th>
<th>PRIVATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>354</td>
<td>348</td>
<td>285</td>
<td>138</td>
</tr>
<tr>
<td>Mathematics</td>
<td>359</td>
<td>518</td>
<td>297</td>
<td>170</td>
</tr>
</tbody>
</table>

Source: California Commission on Teacher Credentialing.

Prior to the agreement with the Governor, UC teacher preparation efforts concentrated on training at the graduate level. Because of the urgency of the math/science teacher shortage, the University broadened its efforts and targeted expansion of the math/science teacher pipeline with a program focused on undergraduates. All general campuses undertook a major commitment to grow and develop teacher education activities in these fields at the undergraduate level.
This commitment began in 2005 as the UC Science and Mathematics Initiative (SMI). The aim of the Initiative was to increase the quantity and enhance the quality of science and math teachers for the State. UC agreed to produce 1,000 new science and math teachers annually. Perhaps more importantly, it also promised to establish a template for the redesign of teacher education programs. A critical feature of this new model is the close collaboration between math/science faculty, who possess the disciplinary expertise, and education faculty, who are experts in pedagogy and who typically have worked with great independence in structuring teacher preparation programs.

What is CalTeach?
Evolving as a new name for—and tangible form of—the systemwide initiative, CalTeach is the collection of UC programs and community college partnerships designed to prepare and support students majoring in science, technology, engineering or mathematics (STEM) disciplines who are interested in becoming K-12 math and science teachers. It consists of a sequence of courses and experiences to introduce students to teaching while they simultaneously complete their undergraduate degrees. Specialized classes and direct work in K-12 classrooms complement disciplinary studies to ready each program participant to pursue a teaching credential after receiving his or her bachelor’s degree.

The basic structure is to recruit early and aggressively (as students enter the University as freshmen), seeking out strong students in mathematics and the sciences and giving them incentives and opportunities to consider a career in teaching. The next stage is for these students to build on these early experiences and move into more advanced courses and experiences, progressing towards the ultimate third phase of transitioning to and completing a credential.

UC offered the first CalTeach courses in winter 2006. The CalTeach seminars—CaT 1-4—are a sequence of courses designed to introduce students to “everyday” teaching issues and problems, building from an initial introduction to teaching through a bridge to the credential program. The CaT courses link pedagogical theory and practice. Having just completed the third year, CalTeach programs are now thriving on nine campuses. Each varies somewhat based on the pre-existing foundation of teacher preparation efforts prior to SMI and on unique campus strengths. As part of a research university setting, the programs also enlist a variety of special resources such the national laboratories, the natural reserve system and the Lawrence Hall of Science.
CalTeach Essential Components
Notwithstanding the distinct character and history of each campus, CalTeach programs are bound by ten essential components common to all. These elements are described below.

1. Recruitment and Advising
   The first component of the program is an aggressive recruitment effort that identifies students with intent to major in math or science, and issues these students personalized invitations to consider teaching. Coupled with the recruitment effort is a strong advising program. Advisors ensure that students know the requirements for relevant undergraduate courses, majors and minors, and have accurate, useful information about becoming a teacher. They also advise students on grants, scholarships, and other forms of aid available to prospective teachers.

2. Coherent Curriculum
   For students who opt to consider teaching, UC campuses offer a coherent sequence of courses in science and education and in mathematics and education. This sequence is designed to provide—within the context of the respective disciplines—an early introduction to the daily, practical issues common to K-12 classrooms. The coursework spans the undergraduate years from freshman to senior.

3. Field Experiences
   Students are engaged in extensive field experiences where they are paired with mentor teachers in K-12 classrooms. They take on a variety of roles from observing to assisting with teaching. These experiences not only provide CalTeach participants direct contact with K-12 students, they also give participants a sense of responsibility and purpose. Students make significant contributions to the learning environments in classrooms where they are placed.

4. Research Experiences
   Participants develop scientific thinking and mathematical reasoning skills as well as other capabilities related to research. While assisting their mentor teachers, they learn how to apply these skills in their teaching practices and to encourage development of these skills in the K-12 students with whom they work.

5. Continuity Components
   Students gain early professional experiences through conferences, credential program recruitment fairs and various network-building activities. These elements promote community within the cadre of students preparing for careers in teaching and support students in continuing on the path to becoming K-12 teachers.

6. Faculty Collaboration Among Science, Math and Education Departments
   Science, mathematics, and education faculty share responsibility for CalTeach. The innovative interdisciplinary partnership between these departments helps assure that students acquire deep disciplinary knowledge in math and science, research techniques, and pedagogical skills. Program graduates will master curriculum that incorporates cutting edge research and innovation in science and math, and they will be ready to work to convey that perspective and experience to their students.

7. Participation by Mentor K-12 Teachers
   Mentor teachers oversee student field experiences in K-12 math and science classrooms. This special program feature creates mentors for prospective teachers who gain the perspective of experienced professionals. The mentors model important lessons in everything from classroom management to delivery of instruction for students of different backgrounds and circumstances. These field placements also provide immediate, expert feedback to students on their initial contact with elementary, middle school and high school pupils.
8. **Ongoing Systemwide Data Collection, Research and Evaluation**
   The University has built an online data system to record, document and manage all aspects of CalTeach. UC also developed a Quality Indicator System to provide benchmarks and regular reports on activities and progress toward goals.

9. **Community College Partnerships**
   Parallel programs established at various community colleges are an integral and critical part of the Science and Mathematics Initiative. These programs provide the same lower division coursework and field placements to high-achieving CCC math and science students as are provided to their UC counterparts. Offering such opportunities enables transfer students to enter UC CalTeach programs as upper-division students with experiences and credits equivalent to those gained by UC students entering those programs as freshmen.

10. **Financial Incentives for Students and Stipends for Mentor Teachers**
    CalTeach students have the opportunity to earn financial incentives for meeting prescribed program benchmarks. These incentives are linked to K-12 field placements and serve to offset travel and other expenses students incur participating in these field experiences. In addition, mentor teachers receive stipends for participating in the program—$275 for each student they supervise.

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**CalTeach on UC Campuses**

All University of California campuses except UCSF have CalTeach programs and are building toward increasing production of high quality math and science teachers. As noted, campus programs share key features but also differ somewhat based on their respective approaches to teacher preparation as well as specializations of their science and mathematics departments. The following summaries provide brief sketches of the programs at several campuses.

**UC Berkeley**

The UCB CalTeach program began in 2005. There was no forerunner or existing structure in place so it was built from scratch. Since its inception, however, participants from across the campus have embraced the CalTeach concept, working together closely to create a program consistent with the broader campus mission as well as the needs of local schools. The departments of origin include mathematics, physics, earth sciences, chemistry, biology, engineering, statistics and education.

CalTeach continues to grow at Berkeley. In addition to six CaT1 seminars, the program has a course on “Teaching Mathematics and Science: A Focus on Equity and Urban Schools.” In spring 2008, UCB piloted a new Environmental Education Practicum, a course framed around the topic of sustainability that engages students from different science majors to apply content knowledge from their discipline to build curriculum pieces for presentation in high school classrooms. In fall 2008, the campus developed a partnership with the history department. This collaboration gave rise to a special CalTeach discussion section along with several “History of Science” courses so that students learn how to incorporate that topic into their teaching. This spring the UCB program plans to start a new course in the Graduate School of Education: “Problem-Solving as an Approach to Teaching & Learning in Mathematics & Science.” Whether new or long-standing, most courses include a field placement in a local school.

As a program, the CalTeach staff has increased from 2 people to 5 people. They recently submitted a proposal to the campus Institutional Review Board to do research and evaluation on the program. They also are pursuing with the CTC a proposal for an experimental credential program in math and science.
UC Irvine

With support from the Science and Math Initiative (SMI) and from a $2.4 million grant from the National Math and Science Initiative (NMSI) Foundation, UCI is developing an undergraduate integrated program to make it possible to complete a bachelor’s degree in a STEM discipline and a single subject math or science teaching credential in 4 undergraduate years. The teacher preparation curriculum for this new program, which will be offered by faculty from the School of Physical Sciences, School of Biological Sciences, School of Social Sciences, and Department of Education, is modeled after the UTeach program curriculum at the University of Texas at Austin. As an entry point, undergraduate STEM majors are encouraged to explore teaching as a career option by enrolling in two CalTeach introductory seminars that include K-12 classroom fieldwork. Students who make early decisions to pursue a teaching credential (typically by sophomore or junior year) go on to complete the other certification courses, culminating in student teaching during their senior year.

A more traditional teacher certification path is open to UCI undergraduate STEM majors who make a late decision to pursue a teaching credential. These students apply for admission to the UCI post-baccalaureate single subject credential program after completing their bachelor’s degree. However, while they are still undergraduates, these students are encouraged to obtain field experience in classrooms through the CalTeach introductory seminars, and they are counseled about five other optional undergraduate education courses that provide an early start on completing some post-baccalaureate teacher credential program coursework.

All UCI STEM students who participate in the UCI CalTeach introductory seminars are eligible for additional paid field opportunities as apprentices in K-12 classrooms and in other regional out-of-school math and science education programs.

UC Los Angeles

The UCLA CalTeach courses began in winter 2006 with 25 students in the CaT1 (elementary focus) math and science seminar. It has grown significantly since as additional seminar levels were brought online. In fall 2006, the campus added CaT2 seminars (middle school focus) and, in fall 2007, the CaT3 (high school focus) seminars began. In 2008, the program expanded to enroll 172 students in nine sections of CaT1, 52 students in four sections of CaT2 seminars, and 30 students in junior level courses in math and the sciences.

For students with a math focus, the CalTeach program feeds into the new Math for Teaching Major. Seniors in this major participate in a capstone math education course and complete their subject matter preparation program. Last year, 16 students enrolled in the capstone math course.

Junior level students with a science focus participate in either a one-quarter CaT3 course for continuing students or a “late-decider option” that meets for the full year. Both math and science seniors can opt to begin the joint BS/credential/MA program with the UCLA Graduate School of Education & Information Studies.

After three years, UCLA CalTeach has exceeded projections for program participants. Recent efforts have focused on maintaining the quality of the seminars, internships, and personal interactions while adding additional pre-professional development activities and workshops.

UC Riverside

At Riverside, a blended program of undergraduate teacher preparation existed prior to the establishment of CalTeach. Since the advent of the program, UCR has expanded and revamped its curriculum to address SMI goals. There is now a highly organized network of coordinated activities at the campus that partner the California Math and Science Teacher program with both the Graduate School of Education and STEM majors and faculty.

Over the past two years, CalTeach students at Riverside have been semifinalists or winners of scholarships from the Rockefeller Brothers Fund Fellowships, the Knowles Science Teaching Fellowship, and the California Retired Teachers Association.
• The Rockefeller Brothers Fund Fellowships is a national search for college juniors of color aspiring to become teachers. Selected fellows work with mentor teachers and complete a summer project as part of the program.

• The Knowles Science Teaching Fellowship is a national competition for graduating seniors preparing for science or mathematics teaching. The program provides professional resources for beginning high school science/mathematics teachers as they earn a teaching credential and through the early years of their career.

• The California Retired Teachers Association offers a local scholarship to help recruit strong new science/mathematics teachers to begin their teaching careers in the local areas.

UC San Diego
UCSD's CalTeach program is embodied, at the undergraduate level, in a new mathematics education minor and science education minor. Unlike traditional teacher education programs in which courses about teaching and learning are “tacked on” to the major in science, mathematics or engineering, UCSD CalTeach bridges disciplines to explore pedagogy in the context of the math and science content. Completion of the minor as an undergraduate reduces the time it takes to complete San Diego's master's/teaching credential program from two years to 15 months.

Since its inception, the campus program has been a partnership between the Division of Physical Sciences and the Education Studies program. Courses in the CalTeach minors were added year by year, and the full complement of courses is now offered. A Department of Education grant (Fund for the Improvement of Postsecondary Education) is also permitting UCSD to provide workshops that introduce in-service mathematics teachers to the unique pedagogical approach used in the CalTeach courses. Fundraising efforts are underway to expand in-service professional development available to enhance the pool of mentor teachers for the program.

UC Santa Barbara
CalTeach has had a big impact on the recruiting and mentoring of undergraduates at UCSB in the last few years. The program has grown from 30 students in the first year to over 160 currently. It is housed within the Gevirtz Graduate School of Education (GGSE) but the success of the program is the result of a collaboration with a number of departments including mathematics, physics, engineering, computer science, chemistry, EEMB (Ecology, Evolution, and Marine Biology), materials research, and MCDB (Molecular, Cellular and Developmental Biology). The campus has fostered partnerships with 30 area schools and 120 teachers.

UCSB's program includes two undergraduate courses, CaT1 and CaT2, which both look at the teaching and learning of science and mathematics, but at grade levels K-6 and 7-12 respectively. A minor has been developed and is going through the approval process. The minor will include CaT2, several general education courses, and a selection of courses taught by the mathematics and science departments. The program has had an impact on the enrollment in the UCSB Teacher Education Program (TEP) as a growing percentage of the science and mathematics students in TEP are SMI alumni. This year, for example, 30 percent of UCSB's science candidates came from CalTeach.

UC Santa Cruz
UCSC received a $750,000 Noyce Teachers Scholars grant from the National Science Foundation to support 32 CalTeach graduates over four years to enroll in the campus MA/teaching credential program. This award bolsters the funding provided by a private donor the previous year to provide smaller scholarships for the same purpose. Undergraduate students in CalTeach appear to be motivated by these post-graduate funding opportunities to pursue their interest in teaching and to do so at Santa Cruz.
The UCSC program has been working with faculty in various science departments and the Education Department to develop curricular programs to better support the teacher pipeline. Proposals—including one for a STEM education minor and others for science education majors—were submitted to the Academic Senate for approval this fall. If approved, UCSC will offer undergraduate majors in earth and planetary science, physics, and biology that are explicitly designed to prepare them for the California Subject Examination Tests and for a smooth transition into teaching credential programs.

**Community College Connections**

As noted earlier in this report, partnerships between the University and California Community Colleges are an essential element of SMI. Transfer students historically comprise a substantial portion of the UC graduates who ultimately earn teaching credentials in math and science. Accordingly, as the CalTeach programs continue to grow, it is clear that the community college transfers will be a critical part of reaching the goal of 1,000 new math and science teachers per year.

A key means to attract CCC students to CalTeach is to provide them with lower division experiences that parallel those offered by the University. Each UC campus has established relationships with local community colleges to create parallel programs. UC campuses recruit high-achieving community college math and science students, encouraging them to take CalTeach seminars and participate in K-12 field placements. Transfers may enter UC programs as upper division students with course credit and classroom experience equivalent to "native" UC peers.

This model is operating as CalTeach-Community Colleges Connections. It includes work in an existing collaborative built over the past few years as well as dedicated new efforts in the northern and southern regions of the state:

- The existing collaborative—known as the Aurora Project—extends throughout California. It was founded at the Foothill De Anza Community College District Office and received initial funding from the Alliance for Regional Collaboration to Heighten Educational Success (ARCHES). Beginning with ten community colleges, it has grown to include 24 community colleges, a few industry partners and a number of county offices of education, school districts and community–based organizations.

- A new effort is getting underway to expand links between the University and the community colleges to increase the pool of UC science and math graduates who are interested in pursuing teaching. UC Berkeley and UCLA will coordinate activities of campuses in the northern and southern regions of the state to establish new effective CalTeach partnerships with the community colleges. To do this work, each campus will receive $150,000 this academic year and next. Resources will be provided through Student Academic Preparation and Educational Partnership (SAPEP) funds.

All partnerships programs—whether part of the original Aurora project or among those to be developed in the next couple of years—include the same essential components found in the UC CalTeach programs. These components include CalTeach seminars, accompanying field experiences supervised by mentor teachers, continuity/support elements including community-building activities, funding (scholarships) for student participants, and stipends for mentor teachers. In addition, CCC Connections emphasizes the recruitment of community college students who are typically underrepresented in mathematics and the sciences and who have the potential to obtain a bachelor’s degree in math or science followed by a teaching credential.
Data

Participation and Student Characteristics

The chart below displays the number of students who participated in *CalTeach* from winter term 2006 through winter term 2008. (Participation here is defined as successful completion of at least one CaT seminar connected with early field experiences.)

**DISPLAY 4: *CalTeach* Student Characteristics: Total Participants to Date (2006-2008)**

<table>
<thead>
<tr>
<th></th>
<th>Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,208</td>
<td>64%</td>
</tr>
<tr>
<td>Male</td>
<td>683</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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<td></td>
</tr>
<tr>
<td>White</td>
<td>600</td>
<td>32%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>349</td>
<td>18%</td>
</tr>
<tr>
<td>Asian</td>
<td>677</td>
<td>36%</td>
</tr>
<tr>
<td>African-American</td>
<td>55</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>210</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Major</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>633</td>
<td>33%</td>
</tr>
<tr>
<td>Science: Biology</td>
<td>599</td>
<td>32%</td>
</tr>
<tr>
<td>Science: Chemistry</td>
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<td>5%</td>
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<tr>
<td>Science: Earth</td>
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<td>1%</td>
</tr>
<tr>
<td>Science: Environmental</td>
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<td>1%</td>
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<tr>
<td>Science: Physics</td>
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<td>3%</td>
</tr>
<tr>
<td>Engineering</td>
<td>87</td>
<td>5%</td>
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<tr>
<td>Computer Science</td>
<td>12</td>
<td>5%</td>
</tr>
<tr>
<td>Other*</td>
<td>356</td>
<td>19%</td>
</tr>
</tbody>
</table>

**TOTAL** 1,891

†The numbers and percentages include data from previous years and preliminary data for the current year. Exact figures will be available at the end of this academic year.

* “Other” includes undeclared or undecided students.

What does this data show? First, participation numbers reflect the magnitude of interest in this undergraduate teacher preparation program. Second, math and biology majors clearly predominate, each representing about one-third of participants for the given time period. Males are somewhat underrepresented, as they are generally in teaching; all ethnic groups are participating, but the proportion who are African-American is small.

Systemwide and Campus Participation

The following displays show total system and campus-by-campus participation in *CalTeach* from winter 2006 to the current year. ("Participation" is defined as enrollment in any *CalTeach* course; 2008-09 figures are estimates.) Although campus participation fluctuates somewhat depending on which courses are offered each term, the overall systemwide trend has been one of steady increase.
Immediate Impact on K-12 Classrooms

One of the distinguishing features of CalTeach is the extensive early fieldwork where participants are paired with mentor teachers and spend 30 hours per term in K-12 classrooms. As part of these field placements, UC students observe, assist, and teach under the guidance of their mentors.

To date, CalTeach students have worked with a total of 521 mentor teachers in 419 schools, working in classrooms a total of 33,976 times.
UC CalTeach students gain valuable “hands-on” experience during their field placements, acquiring instructional tools and techniques from expert teachers in the field. In addition, many of the mentor teachers note that CalTeach participants exemplify positive role models for the students in their classrooms. Some teachers describe them as “ambassadors” who instill an excitement for science and mathematics as well as inspire aims of college attendance among the K-12 students with whom they work. The following are quotes from mentor teachers who supervise CalTeach students:

“Young students always enjoy having college students in the classroom. For some students, this is their first experience of ‘seeing’ a college student. It may help some elementary students see the option of university as a reality.”

“They see young people excited about school and enrolled in college and adults they can talk to about their learning and relate to more.”

“Having a college student interested in science there and interacting with the kids was a benefit. My students enjoyed asking them questions.”

“My students looked forward to the days when the SMI students were in the classroom.”

In addition to the impact on the K-12 students, the mentor teachers also commented on the value added to their own professional growth:

“Being able to talk about my own teaching practice, explain what I’m doing and why, and watch young people experience success at interacting with students brings a value that is not attainable in any other way.”

“I got a different perspective and some new ideas.”
“It kept me on my toes, allowed me to guide an upcoming teacher through the presentational process, and allowed me to watch my students during the direct teaching of the SMI student.”

Mentor teachers have expressed enthusiastic support for the program: more than 90% of those surveyed indicated that they would like to host another CalTeach student.

**Evaluation**

**Enrollment Targets**

Given the scale, scope and novel nature of CalTeach, there are no comparable programs within UC on which to base projections of student participation. However, using data from a variety of sources—including the University of Texas UTeach program—a model of enrollment targets was developed to estimate program growth. This model is helpful in assessing the University’s progress toward its goal of producing 1,000 math and science teachers annually.

The chart below shows the total program enrollment numbers to date followed by the enrollment targets for subsequent years. The current model aims at reaching a steady-state total enrollment of 6,750 students. This number takes into account attrition over the four years as well as incorporating transfer students and students who enter the program at a later stage of their undergraduate program. This steady-state enrollment target will yield 1,000 graduates each year who enter credential programs in mathematics and science.

Since CalTeach is still relatively new and has little of its own longitudinal data, it is helpful to identify other mechanisms to determine whether this expected growth might actually be realized. The UTeach program at the University of Texas provides a good option for comparison. Several CalTeach components were modeled on the Texas paradigm and the two programs share certain goals and features.

Approximately ten years of data have been collected on UTeach. Like UC, the University of Texas historically did not initially serve as a major training ground for significant numbers of new teachers. However, the urgent need for more and better math/science instructors and the presence of large numbers of talented students in those fields at
the Austin campus led that institution to assume responsibility in this area. Since its inception, the program has had great success; it has expanded the teacher corps far beyond levels traditionally seen in a research university. The graph below illustrates that success and, given similarities between the Texas and UC efforts, bodes well for the future of CalTeach.

**Impact on Science and Mathematics Teaching Credentials: Benchmark 1,000**

Because obtaining a credential is at least a five year process from the time a student begins college as a freshman, it is still early to measure the impact of the CalTeach programs. The contribution of these programs to increasing math/science teacher production—whether participants go on to obtain a credential at UC or elsewhere—cannot yet be fully assessed.

Nonetheless, many campuses indicate that initial enrollment increases are becoming apparent; about half of the UC credential programs report increases in the numbers of students entering in math and science. Furthermore, most of these students either participated in one or more CalTeach courses or mentioned that the increased attention and activity around math and science teaching on the campuses made them more aware of the credential program options.

Historically, the majority of UC math/science graduates interested in teaching completed their credentials somewhere other than the University. Approximately one-third complete their credential work at UC, one-third at CSU and one-third at a private institution. Taking this pattern into consideration, the following chart shows historic data and projections for the growth in the number of UC math and science graduates receiving teaching credentials over the next few years.
Though the University will not award all 1,000 credentials, data projections indicate (1) that there will be significant growth in the number of UC graduates obtaining math/science credentials over the next few years, and (2) that the University will be at or near its goal of increasing to 1,000 the annual number of its graduates who become credentialed math/science teachers.

Quality and Retention in CalTeach

CalTeach is intended not only to attract a new and larger cadre of math/science students into teacher education, but also to change the quality of preparation of these students. The program is beginning implementation of a multi-dimensional monitoring system for measuring quality that will involve a mixed-methodological approach combining quantitative and qualitative data. Quantitative data will include grades, test scores, numbers of hours of field experiences, and numeric ratings by supervisors. Qualitative data will include survey questions, reflections, and interviews. These data will be used not only to evaluate and monitor participants but also to yield a rich understanding of the program components—what is working and what is not.

An ambitious yet affordable research and evaluation system of quality indicators will take a few years for CalTeach faculty and other leaders to develop and refine. In the interim, the University is administering surveys of participants to learn about students’ levels of satisfaction with CalTeach as well as the likelihood that they will complete the program and obtain a credential. A total of 471 students completed last year’s survey. The survey data is summarized below.
Assessing the impact of CalTeach on the quality of math/science teachers it helps prepare presents a variety of challenges. It is difficult, for example, to isolate what elements of effective teaching are attributable to the program’s portion of teacher preparation. Still, proxy measures (such as undergraduate GPA) can be used indicate whether there have been changes in the quality of candidates drawn into teaching through the program. University of Texas, Austin, used this approach as part of its evaluation of UTeach. Before the UTeach program, those students from the College of Natural Sciences who later became teachers had below-average GPAs as undergraduates. However, after implementing UTeach, program alumni who became math and science teachers graduated at higher rates and had significantly higher GPAs than their undergraduate peers.

Although we do not yet have as much longitudinal data as UTeach, early indicators point to CalTeach success in recruiting students with strong academic records. For instance, at UC Riverside in fall 2007, the CalTeach cohort of prospective math teachers had a 3.12 average GPA whereas the average GPA among all mathematics majors was only 2.91. The research and evaluation system currently under development will, among other things, enable CalTeach to track the GPAs of all program participants. Over time, additional data of this type will reveal whether providing a coherent, intellectually challenging program to recruit and prepare math and science teachers will continue attract a new pool of students who excel academically.


Estimated Program Costs for 2008-09

*CalTeach* receives funding from three sources:

- **State Funds**: The State provides $1.125 million annually ($125,000 goes to each of the nine general campuses that participate in *CalTeach*).
- **University**: UC matches the total State appropriation, with each campus providing an additional $125,000. In addition, there is a core budget account at the Office of the President for systemwide program support (e.g., program director’s salary, data portal, fundraising activities). The current balance of the core budget is approximately $200,000.
- **Extramural**: Funds have been raised from a variety of corporate foundation and other private industry sources, including AT&T and Intel.

The cost of running *CalTeach* for 2008-09 is estimated to be $7.24 million. The program budget for the current year is shown below. Absent any change in this structure, demand for student incentives alone could grow to as much as $4 million by 2010-11.

**DISPLAY 13: CalTeach Program Costs**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Instruction</td>
<td>$1,595,000</td>
</tr>
<tr>
<td>(2) Instructional support costs</td>
<td>391,000</td>
</tr>
<tr>
<td>(3) Supervision &amp; coordination of field placements, administrative support</td>
<td>2,900,000</td>
</tr>
<tr>
<td>(4) Financial incentives for students</td>
<td>1,824,000</td>
</tr>
<tr>
<td>(5) Stipends for teachers</td>
<td>531,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$7,241,000</strong></td>
</tr>
</tbody>
</table>

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**DISPLAY 12: Average GPA’s of UC Riverside’s Fall 2007 SMI Cohort (Math)**

- **SMI Participants**: Average GPA of 3.12
- **All Math Majors**: Average GPA of 2.91
(1) Please note that instruction is the cost of faculty salary and benefits for teaching 1930 students taking 122 sections of CalTeach courses.

(2) Instructional support costs include paying for TB tests, fingerprinting, and background checks (required for anyone who works with students in public schools); reimbursement of student travel expenses, educational supplies, and classroom materials used in K-12 field work; and program recruitment and advertising costs.

(3) Coordinating, supervising, and placing students in classrooms with mentor teachers requires a considerable number of people. This category also includes administrative support and release time for faculty directing programs.

(4) The estimate is based on the existing model of student incentives that sets awards at $600, $800, $1,100, and $2,500 for program levels 1-4 respectively. (Though most campuses follow this model, there is some variation on a few campuses.) This structure will be revised as part of a new SMI business plan now under development and the actual figure for the current year likely will be lower.

(5) Mentor teachers are paid $275 for each student they supervise in their K-12 classrooms. Mentors are expected to meet with, observe, guide and instruct CalTeach participants.

SMI: Progress to Date and Future Directions

The Science and Mathematics Initiative has completed its third year. Since it began, SMI has evolved from an ambitious commitment into a vibrant collection of CalTeach programs that aim to increase the number of well-prepared math and science teachers in the State. This evolution has unfolded in a series of steps with significant development and implementation phases already complete and additional growth still to come.

1. Development of the Overall Plan, 2004-05
   Obtaining Funding, both Public and Private
   Campus Review and Organization

2. Implementation, 2005-07
   Campus-by-Campus Curriculum Organization (course and degree design)
   Establishing Links with Schools and Colleges
   Continued Fundraising

3. First Full-Year Program Operation, 2007-08
   Design Refinement

4. Intermediate Expansion & Growth, 2008-09
   Continued Enrollment Increases, including Community College Partnerships

5. First Class of Graduates, 2010
   Program Institutionalization

6. 1,000 Teacher Goal, 2010-11

As the developmental trajectory illustrates, it requires several years to carry out an initiative of this magnitude. CalTeach has very successfully navigated the formative stages of development and, with a solid foundation, continues to grow. Campus programs have forged crucial, productive working relationships between math, science and education faculty and have found remarkable acceptance from students, who are enrolling in the program courses in noteworthy numbers throughout the UC system.
Notwithstanding these accomplishments, *CalTeach* faces fiscal challenges. These challenges arise in part from the program’s success in rapidly increasing student participation and in part from budgetary circumstances now facing the University.

- **Excess Demand on Stipend and Financial Incentive Funds**
  As noted above, mentor teachers receive stipends for participating in the program and students receive financial incentives. Stipends and incentives generally are paid from extramural funds raised systemwide. At this point, campuses have expended nearly all of the funds set aside for this purpose, including approximately $275,000 disbursed at the end of the fall term. Significant enrollment growth caused a steep increase in demand for stipend and incentive funds that outpaced total monies raised. For 2007-08, $800,000 was needed to cover demand; this year, $1.8 million is needed to cover demand under the existing tiered incentive structure.

- **Diminishing Resources at the System Level**
  SMI inherited a set of system funds that were formerly dedicated to a forerunner program called California Mathematics and Science Teachers (CMST). As indicated above, these monies were placed into the core budget account at the Office of the President. This central source has been carried forward and replenished annually. These resources support functions important to continued program cohesion and success, including data collection and a systemwide program director.

  State budget imperatives make it clear that these funds, like other central unrestricted monies, cannot continue to be allocated at this level indefinitely for support of programs, including *CalTeach*. In this fiscal climate, initiatives started by or in partnership with the Office of the President must become sustained via the campuses or other means after an appropriate but limited inception and transition period. This evolution is vital not only for budgetary reasons but also for the campuses to take ownership of key initiatives and incorporate them into their respective academic and administrative structures. Moreover, UC system efforts to respond to State priorities—such as the math/science teacher shortage—should be integrated into the fabric of strategic goals for each campus. This integration is essential to effective fulfillment of the University’s public service mission.

Given these circumstances, the University is developing a plan to address these fiscal challenges. The plan will identify new strategies for funding student incentives and teacher stipends as well as central coordination, data collection, program evaluation and fund-raising activities that are vital to *CalTeach*. With respect to evaluation, it will outline plans to expand and refine methods to gauge program effectiveness. Robust assessment on a variety of metrics should provide the feedback necessary for continuous improvement.

In broad terms, relevant questions center on whether students will find the *CalTeach* pathway to a teaching credential to be an attractive option, whether program graduates will follow through and obtain teaching credentials, and whether interdisciplinary alliances between math/science and education forge a notably stronger preparatory curriculum for those who become new teachers. The significant, steep enrollment growth trend appears to answer the first of these questions; initial indications are affirmative for the second and third questions as well. For now, the University must continue to support these programs and foster the growth needed to help meet California’s pressing demand for a larger, stronger teacher corps in math and science.

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