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 12, of the 2007 Budget Act, enclosed is the University of California's annual report to the Legislature on the Science and Math Teacher Initiative.

If you have any questions regarding this report, Associate Vice President Debora Obley would 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,

[Signature]

Robert C. Dynes

Enclosure

cc: The Honorable Jack Scott, Chair  
Senate Budget and Fiscal Review Subcommittee #1  
(Attn: Ms. Amy Supinger)  
(Attn: Ms. Cheryl Black)  
The Honorable Julia Brownley, Chair  
Assembly Budget Subcommittee #2  
(Attn: Ms. Sara Bachez)  
(Attn: Ms. Amy Rutschow)  
Ms. Elizabeth Hill, Legislative Analyst  
Mr. Mike Genest, Director of Finance  
Mr. E. 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 (17)  
Provost Wyatt R. Hume  
Executive Vice President Katherine N. Lapp  
Vice Provost Joyce B. Justus  
Associate Vice President Debora Obley  
Interim Assistant Vice President Karen French
University of California
Report on the Science and Math Teacher Initiative
2007-08

The following report is forwarded in compliance with Item 6440-001-0001, provision 12, of the 2007 Budget Act for 2007-08, which states:

Of the funds provided in Schedule (1), $1,125,000 is appropriated for science and math resource centers to implement the Science and Math Teacher Initiative. The University of California (UC) shall report to the Legislature and the Governor by February 1, 2008, on its progress toward increasing the quality and supply of science and math teachers. This report shall include the following information: (a) annual number of math 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 provision, (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 math or science teacher 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. The California Council on Science and Technology (CCST) and the Center for the Future of Teaching and Learning (CFTL) recently analyzed data on the State’s teacher workforce and found that more than 10 percent of all math and science teachers in California are underprepared. Due to retirements and other factors, one-third of California’s students may find themselves in classrooms without a qualified math/science teacher within the next five years.

• The University of California is reshaping and expanding its undergraduate programs to address this very important educational need. Under the rubric of Cal Teach/SMI, UC is recruiting its entering math/science majors with new minors or concentrations focused specifically on mathematics and science teaching, providing them with early field experiences in schools, and reshaping pathways to the credential in innovative ways to assure deeper subject matter content knowledge and strong pedagogical skills among program participants.
Evidence of the innovation and promise of this new program is demonstrated as two of UC’s campuses – UC Berkeley and UC Irvine – are recipients this year of prestigious $2.4 million grants that Exxon Mobil has awarded to only 12 universities across the nation.

Program components of Cal Teach/SMI common to all UC campuses are recruitment and specialized curriculum; field experiences beginning at freshman year; ongoing participation in professional conferences and community building; development of scientific research skills; collaboration among science, math, and education departments in developing curriculum and teaching courses; ongoing faculty participation in pioneering pedagogy specifically tailored to each area of science and math; Master Teacher oversight of students in practicums; rigorous data collection and program evaluation; partnership with community colleges; and financial incentives for student participation.

To date, 1,266 students have participated in Cal Teach/SMI, with participation being defined as successful completion of at least one of the Cal Teach Seminars connected with early field experiences. In addition, to date UC SMI students have worked with a total of 665 mentor teachers in 239 schools.

In this past year, SMI has made extraordinary progress in its work with California Community Colleges – work that has duplicated the course content of the signature SMI courses at all participating community colleges, provided equivalent transfer credit for participants, and provided stipends that fund student practicums in local K-12 schools.

Data gathered as early indicators of success show that if community college transfer students are included, UC may reach as high as 96% of its target increase in well-prepared new teachers of science and mathematics by 2010-11.

The University is building a comprehensive system for measuring the quality of the SMI graduates, an effort that will contribute to the State’s information store on teacher quality and teacher preparation. Early indications from this system are positive in terms of GPA’s earned by SMI participants.

Because Cal Teach/SMI is an academic program that takes at least four years for students to complete, UC has not yet graduated its first cohort of program participants. This report includes information requested in the 2007 Budget Act, such as an expenditure plan for the program and information about the effectiveness of the program’s different components and activities. The first full set of outcome data, however, will not be available until 2010. Some data, such as future credentials awarded to math and science students per UC campus and job placement of those credentialed students, may ultimately be difficult to collect due to limited funding and the fact that SMI is not in itself a credential program. Most participants will go elsewhere to receive their actual credential.
• The cost of operating the Cal Teach/SMI program in 2007-08 was roughly $5 million. Of that total, $1,125,000 was provided by the State as a designated allocation.

California’s Teacher Challenge in Math and Science

The California Council on Science and Technology (CCST) and the Center for the Future of Teaching and Learning (CFTL) recently joined many other state, federal, and private sector experts in drawing attention to California’s alarming lack of well-qualified K-12 teachers in science and mathematics. CCST and CFTL recently analyzed data on the State’s teacher workforce and found that more than ten percent of all math and science teachers in California are underprepared (lacking 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. The CCST and the CFTL have determined that, 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. In other words, one-third of the State’s 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 to develop a workforce with the knowledge and critical 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 to address the challenge facing California’s schools.
The University of California Cal Teach/SMI Program

The University of California has stepped forward to enlist its very considerable strengths in mathematics, science, and education to address this issue. In doing so, the University has committed itself to the three strategic goals shown above, revamping both the quality and quantity of teachers produced by its programs. Because the University attracts the State’s highest achieving students, and a very significant share of California’s talent and skills in science and mathematics, it has the capacity to make a dramatic difference in this area.

In the past, the University’s production of new teachers has been much less robust than that of other segments of higher education in California. Notwithstanding this fact, UC has traditionally produced a sizable proportion of math and science teachers – much higher than in other disciplinary areas, such as multi-subject credentialed teachers and single subject teachers in humanities and social sciences. The University’s production of math and science teachers is the result of its enrollment of such a high proportion of California’s most accomplished math and science students. In 2006/07, 29% of UC baccalaureate recipients completed their degrees with majors in math or science; this means over 12,000 new science and math graduates emerged from UC this past year.

University of California campuses have traditionally concentrated on graduate-level teacher training, rather than undergraduate teacher training programs. But in establishing the Cal Teach/SMI program, the University will be expanding its undergraduate programs for greater quantitative production within a shorter time frame. It does require, however, a significant shift in UC’s teacher education model.

Because of the urgency and the importance of the math/science teacher crisis, and the University’s unique strengths in these disciplines, all UC general campuses have undertaken a major commitment to the growth and development of their undergraduate teacher education programs. In addition, these programs will enlist the involvement of unique resources such as the Lawrence Hall of Science, the national laboratories, and the natural reserve system in this important effort.

In 2005 the University initiated Cal Teach/SMI, aiming to increase the number of UC students it trains to be science and math teachers from 250 per year to 1,000 per year. Perhaps more importantly, it also promised to establish a template for the redesign of teacher education programs by involving science and mathematics faculty much more extensively, along with education faculty who are experts in pedagogy and have traditionally worked more independently in structuring teacher preparation programs. The University is now in the third year of this effort and expects to see its first graduates in 2010. Because of this timeline, the first full set of outcome data will not be available until 2010.

What is the SMI?
The Science and Mathematics Initiative is a systemic program designed to create a robust set of pathways leading students to a credential in teaching mathematics or science. The
UC has a long and successful history of developing top quality mathematics and science teachers, but this is this first time that all UC general campuses have joined forces to create a coherent large-scale initiative for increasing the number and quality of math and science teachers.

Every UC campus has its unique contexts and strengths, so the specific programs on each campus differ in their structure and content, depending on the pre-existing base for teacher preparation as well as the science and mathematics programs the campus offers. Nonetheless, there is broad agreement about what is important in producing math and science teachers of the highest quality.

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.

(Please note that the Cal Teach 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 [CaT1] through a bridge to the credential program [CaT4]. The CaT courses link pedagogical theory and practice.)

**SMI Essential Components**

As the foregoing demonstrates, UC is building a wide-ranging and unique array of teacher preparation programs, blending individual campus strengths in the sciences and mathematics with the distinctive existing teacher preparation programs which serve as a foundation for this new effort. The ten elements common to all of the University of California campus Cal Teach/SMI programs are described below.

1. **Recruitment and Curriculum**
   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. For students who opt to consider teaching, UC campuses offer a coherent sequence of courses – spanning the undergraduate years from freshmen to graduation – in science and education...
or mathematics and education. In particular, every campus offers a series of special Cal Teach seminars (i.e., CaT seminars) that are designed to provide an early introduction to the daily, practical issues common to K-12 classrooms. The program not only encourages participants to consider teaching as a career, but provides them with experience in K-12 classrooms from freshman year onwards.

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

3. **Continuity Components**
   Students gain early professional experiences through attendance at conferences and credential program recruitment fairs; they also participate in network-building activities. These elements promote community within the cadre of students preparing for careers in teaching and help students see a clear path to teaching in K-12.

4. **Research Experiences**
   Participants develop scientific thinking skills and other research skills, learn how to develop scientific thinking in their own K-12 students while teaching, and apply scientific thinking to their own teaching practices.

5. **Collaboration of Science, Math and Education Departments**
   Science, mathematics, and education faculty share responsibility for the Cal Teach/SMI program. The innovative interdisciplinary partnership between these departments helps assure that students acquire deep disciplinary knowledge in math and science as well as research techniques, while also working in K-12 classrooms and building pedagogical skills. Teachers emerging from this program will have mastered curriculum incorporating 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.

6. **Faculty Participation**
   The program includes ongoing faculty engagement in developing innovative techniques for ensuring students’ mastery of multidisciplinary subject matter. In Cal Teach/SMI, faculty in math and science work in an ongoing process with their education colleagues to build pedagogy appropriate to each area in math and science.

7. **Participation by Master K-12 Teachers**
   Master teachers oversee student field experiences in K-12 math and science classrooms. This unique feature of the program creates mentors for beginning
teachers who gain the perspective of these mentors in all respects, such as classroom management and delivery of instruction geared to different students and circumstances. This feature also provides immediate, expert feedback to students on their initial teaching from practiced providers.

8. Ongoing Systemwide Data Collection, Research and Evaluation
The University has built an online data system to record, document, and manage all aspects of SMI. The University has also developed a Quality Indicator System to provide benchmarks and regular reports on SMI activities and progress toward goals.

9. Community College Partnership
UC has established a parallel program in community colleges, which recruits high-achieving math and science students at community colleges and provides them with SMI coursework and classroom K-12 field work programs. This parallel effort allows transfer students to enter UC SMI programs as upper-division students with experiences and credits equivalent to those gained by students entering UC as freshmen. (A full description of this new program is provided later in this report.)

10. Financial Incentives for Students
All students participating in Cal Teach/SMI have the opportunity to earn cash incentives for meeting prescribed benchmarks in the program, as well as to articulate their undergraduate program with graduate credential requirements.

Cal Teach/SMI on UC Campuses
All University of California campuses have initiated Cal Teach/SMI programs and are building toward the twin goals of quality and quantity in math/science teacher production. Individual campus plans share certain features and components of Cal Teach/SMI; because their pre-existing teacher preparation programs differ, however, each campus’ new structure is distinct. Following are key successes achieved by the Cal Teach/SMI program thus far in its implementation.

UC Berkeley
Cal Teach/SMI programs at UC Berkeley and UC Irvine this year received two of only 12 prestigious grants given nationwide by the National Math and Science Initiative. The grants, $2.4 million each, were provided by ExxonMobil to encourage creative experimentation in science/math teacher preparation and to demonstrate outcomes of innovative teacher preparation programs. Both the UC Berkeley and UC Irvine programs will work in tandem with 10 peer institutions across the nation to revitalize and renew math and science pedagogy, to find ways of attracting high-achieving math and science students into the teaching field, and to document the results of their programs.

Receiving this grant at UC Berkeley is particularly noteworthy, since no undergraduate teacher preparation program existed at this campus previous to SMI (the campus only had a graduate program). The Cal Teach program at Berkeley began in 2005, essentially
from scratch. From its inception, however, participants from across the UCB campus – departments of origin include mathematics, physics, earth sciences, chemistry, biology, engineering, statistics, and education – have embraced the Cal Teach concept and worked closely to structure a program consistent with the broader campus mission and the needs of the local schools.

CaT1 courses began in the spring of 2006, building on the very successful “Communicating Science” courses that Berkeley faculty have been offering in conjunction with the Lawrence Hall of Science. In the first semester, 18 students enrolled in the two CaT 1 courses. In fall 2006, the number of different CaT 1 courses increased from two to four, and the number of enrolled students increased from 18 to 41. In spring 2007, both CaT 1 and the follow-up course “Preparing to Teach Mathematics and Science: A Focus on Equity and Urban Schools” (CaT 2) were offered, the latter for the first time, with a total enrollment of 92 students. All of these courses include intensive field placements in local schools.

**UC Irvine**

At UCI, five science and math departments (Biological Sciences, Chemistry, Computer Science, Mathematics and Physics), in collaboration with Irvine’s Department of Education, have developed accelerated degree plus teacher preparation programs. Other key features of UCI’s program include aggressive recruitment of incoming freshmen and sophomores to encourage them to consider teaching careers; seminars and fieldwork that allow undergraduates to explore teaching; research-based education curriculum that is specific to teaching in the disciplines of math and the sciences; and ongoing academic counseling support for program participants.

At UC Irvine, there was an existing Minor in Educational Studies prior to 2005 and SMI. Now that Minor has been expanded very considerably with a range of courses for early exploration of teaching through seminars and paid field work.

**UC Riverside**

At other campuses such as UC Riverside, a blended program of undergraduate teacher preparation existed prior to the establishment of the Cal Teach/SMI program. Since the advent of SMI, UC Riverside has expanded and revamped its curriculum to address SMI’s goals. There is now a highly organized network of coordinated activities at UCR 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, UC Riverside SMI students have been semifinalists or winners of scholarships from the Rockefeller Brothers Fund Fellowships, the Knowles Science Teaching Fellowship, and the California Retired Teachers Association.
UC Santa Cruz
This year, UCSC’s MA/credential program has 32 math and science applicants, and 12 applicants (37.5%) have completed at least one Cal Teach internship. The number of applicants has increased 33% over that of last year, and 37.5% of this year’s applicant pool are Cal Teach students.

Historically at UCSC, the number of students pursuing a credential has varied considerably year to year; small numbers mean a few individual choices drive large percentage changes, but the pool this year reflects the dramatic impact of Cal Teach. There are eight more applicants to the math/science program than last year, and eight more Cal Teach/CMST applicants to the math/science program than last year. UCSC education department leadership attributes this growth directly to the Cal Teach program. The Education Department is planning to admit all the science and math students who are qualified, and expects an approximate 50% yield of admitted students.

UC Merced
UC Merced has established a pioneering Cal Teach/SMI program through the Natural Sciences Education Department. The 24-unit Natural Sciences Education Minor will prepare students majoring in sciences, mathematics or engineering for direct admission into teaching credential programs, such as the one administered by California State University, Stanislaus (CSUS). UC Merced’s Minor program was developed with careful consideration of the teacher credential program at CSUS to ensure that students who complete the NSED Minor will be able to enter CSU’s program and thus obtain a teacher credential as efficiently as possible. In addition, students will have an opportunity to become intern teachers at CSUs as they enter the teacher credential program, thereby allowing them to start their teaching career earlier and receive compensation while completing the single-subject credentials.

Community College Component
A central component of the University of California’s Cal Teach/SMI program is collaboration with community colleges, including establishing relationships and programs that offer community college freshmen and sophomores equivalent SMI coursework, field experiences, and stipends so that these students can enter the University with equivalent background to their peers at UC.

The collaborative, called The Aurora Project, extends throughout California and offers community college students seminar courses, engages them in field experiences at K-12 schools, and provides scholarship support as they pursue their eventual degrees in math/science and their teaching credential. The collaborative members include institutions of higher education, county offices of education, school districts, industry representatives, and community-based organizations.

Founded at the Foothill De Anza Community College District Office, The Aurora Project received its initial funding from the Alliance for Regional Collaboration to Heighten Educational Success (ARCHES). Aurora began with ten community colleges in two sites, one in Northern California and one in Southern California. It has now expanded
and operates at 18 community colleges (five in Southern California, three in the Santa Barbara region, four in the Silicon Valley/San Jose region, three in the Santa Cruz/Monterey Bay region, and most recently three in the Central Bay region).

Aurora is a complex operation, involving UC and CSU faculty, staff, and deans; community college instructors and counselors; K-12 school district assistant superintendents; and principals and teachers at local schools. In addition, Aurora has enlisted financial contributions and support from a variety of industry partners.

**Industry partners** include:
- NASA Ames Moffett Field
- Agilent Technologies Foundation
- Symantec Foundation
- Greater Riverside Chambers of Commerce

**Community College Partners** include:
- Foothill DeAnza Community College District
- DeAnza College
- Foothill College
- San Jose City College
- Evergreen Valley College
- Cabrillo College
- Hartnell College
- Monterey Peninsula College
- Ventura Community College
- Allan Hancock Community College
- Santa Barbara City College
- Laney College Diablo Valley College
- San Francisco City College
- Chaffey College
- Pasadena City College
- Riverside Community College
- San Bernardino Valley College
- Santa Monica College

**Community College SMI Program Features**

- **Offers community college students classroom field experiences supervised by a mentor teacher**
  Following the model currently implemented at each of the UC campuses, community college students are assigned to two-person student teams (in most cases) in local school classrooms for 3-5 hours per week to observe and work with a “mentor teacher” in each classroom. As college freshmen, students are placed in an elementary or middle school classroom. As sophomores, students are placed in a middle school or high school classroom. Placements enable the college students to become familiar with the workings of the schools and the
teaching and learning of math and science that precede and exist in the high school environment.

- **Offers community college seminars to accompany the field experiences**
  To accompany the field experiences at local schools, SMI provides students with seminar courses at their community college. The seminars address curriculum, pedagogy, and the national and state standards for mathematics and science. In the first years of implementation of the seminars, the program has encouraged community colleges to waive the minimum class size requirement of 18-25 students per class in order to enable the weekly seminars to take place.

  Seminars are coordinated and taught by faculty members from the various community colleges who have the freedom to plan the topics covered during the sessions. The seminars always allow ample time for discussion about students’ experiences during the week in the classroom, conversations that are considered to be part of the most valuable experiences taken from participation in The Aurora Project.

- **Recruits community college students who are underrepresented in math and science**
  SMI emphasizes the recruitment of students who are typically underrepresented in mathematics and the sciences and who have the potential of obtaining a Bachelor’s degree in math or science followed by obtaining a secondary teaching credential.

- **Provides community college students with professional development from mentor teachers**
  SMI introduces students to professional development at an early stage in their academic careers by encouraging mentor teachers to work with the college students to review the material being taught, discussing those aspects of the lessons that seemed to go over well, and how a future presentation of similar material could be improved.

- **Creates support groups of community college students, classroom teachers, and instructors**
  The program encourages community college student retention by providing a support group of cohort students, community college instructors, and mentor teachers.

- **Provides funding for each participating community college student**
  SMI uses existing funds and seeks additional grants and other financial support from foundations, private industry, and the State in order to provide “scholarships.” Each freshman and sophomore community college student typically receives $500-$700 per year of participation, and the scholarships cover the costs of travel, fingerprinting and TB testing.
• **Provides stipends to mentor teachers**
  To increase the participation of mentor teachers, SMI encourages school districts to provide stipends to each mentor teacher for time spent with community college students outside of the school classroom.

• **Offers UC/CSU advisor meetings with community college students**
  SMI engages faculty and staff from UC and CSU campuses to meet each quarter/semester with participating community college students to describe the ongoing math/science/education programs at UC/CSU campuses, and to encourage community college students to apply for admission to UC as juniors.

### Data

#### SMI Student Characteristics
The chart below displays the number of unique individuals who have participated to date in Cal Teach/SMI (Winter term 2006 through Winter term 2008). Participation here is defined as successful completion of at least one of the Cal Teach Seminars connected with early field experiences.

<table>
<thead>
<tr>
<th>SMI Student Characteristics: Total Individuals To Date</th>
<th>Students</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
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</tr>
<tr>
<td>Female</td>
<td>833</td>
<td>66%</td>
</tr>
<tr>
<td>Male</td>
<td>433</td>
<td>34%</td>
</tr>
<tr>
<td>Ethnicity</td>
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<tr>
<td>White</td>
<td>431</td>
<td>34%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>246</td>
<td>19%</td>
</tr>
<tr>
<td>Asian</td>
<td>477</td>
<td>38%</td>
</tr>
<tr>
<td>African-American</td>
<td>36</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>76</td>
<td>6%</td>
</tr>
<tr>
<td>Major</td>
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</tr>
<tr>
<td>Science: Chemistry</td>
<td>77</td>
<td>6%</td>
</tr>
<tr>
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<td>3%</td>
</tr>
<tr>
<td>Engineering</td>
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<td>6%</td>
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<tr>
<td>Other*</td>
<td>278</td>
<td>22%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1266</td>
<td></td>
</tr>
</tbody>
</table>

* “Other” includes undeclared or undecided

What does this data show? First, it is a reflection of the number of students entering UC campuses who are sufficiently interested in this teacher preparation program to enroll for coursework and other experiences. It also shows the gender and ethnicity of these
participants; males are somewhat underrepresented, as they are generally in teaching; all ethnic groups are participating, but the proportion who are African-American is small. Finally, the preponderance of students are majoring in mathematics and biology, with smaller representations in physics, chemistry, and engineering.

**Campus-By-Campus Participation**

The following chart shows the campus-by-campus participation and total system participation in SMI for each academic term. (Please note that “participation” is defined as enrollment in a Cal Teach seminar course.) Although the participation levels fluctuate on a given campus (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 and innovative features of the SMI is the extensive early field experiences, in which SMI students are paired with mentor teachers and spend thirty hours over a term in K-12 classrooms. In the course of these experiences, the UC students observe, assist, and teach under the guidance of their mentor teachers.

To date, UC SMI students have worked with a total of 665 mentor teachers in 239 schools, working in classrooms a total of 20,274 times.
UC SMI students gain valuable “hands-on” experience and acquire practice and teaching tools from expert teachers in the field. But there are other immediate impacts from this element of the program. Many of the mentor teachers noted that SMI students exemplify positive role models for the students in their classrooms. Some teachers described the SMI students as “ambassadors” who instilled an excitement for science and mathematics and college attendance in the K-12 students they worked with. Here are some typical quotes from mentor teachers who work with Cal Teach/SMI students in their classrooms:

“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 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.”

The mentor teachers have expressed enthusiastic support for the program: 108 out of 115 surveyed last spring (94%) indicated that they would like to host another SMI student.

Strategic Goals and Measurements of the Community College CalTeach/SMI Program
The Community College Cal Teach/SMI Program demands the cooperation and collaboration of many different partners – UC, CSU, community colleges, and school districts and schools. In order to support this alliance, all parties must commit to a well-defined set of principles and goals. The measures all partners have defined for monitoring and managing the program as well as evaluating its success are:

a) Number of community college students that continue to take math and science courses
b) Number of community college students that enroll in a second seminar course/field experience
c) Number of participating community college students that transfer to UC or CSU or another four-year college with the goal of becoming a math/science teacher
d) Student participant attitude changes as measured by attitudinal instruments
e) Expansion of The Aurora Project to additional community colleges, especially those 35 community colleges (approximately three-quarters of which are already participating in SMI) that transfer the highest number of mathematics and science students to UC and CSU

Student Achievement Template
The Student Achievement Template below includes the number of community college students who have taken a CaT 1- or CaT 2-type seminar course at their college, have been engaged in a field experience in a local elementary, middle, or high school, and are making progress in their science/math courses. For the winter/spring quarter/semester of 2008, a judicious estimate is also provided.

Every community college listed (excepting the most recent Community College Partners, Laney, Diablo Valley, and San Francisco City) has created a CaT 1-type seminar and field experience. Every community college that offered a CaT 1-type seminar and field experience in 2006 has continued to do so in 2007 and in all cases has expanded the number of times the course is offered. Community colleges that began a CaT 1-type seminar and field experience in 2006 have also either created a CaT 2-type seminar and
field experience in 2007 or have allowed students to take the CaT 1 seminar more than once. Courses have been articulated both to UC and CSU.

While it is still too early in the program to predict the precise number of students who will persist to become secondary math/science teachers, to date the persistence rate within the program is 65%-75%. At some of the colleges, e.g., Evergreen Valley in San Jose, almost 100% of the currently-enrolled students who completed the CaT1 seminar and field experience are planning to continue with the CaT2 seminar and field experience.

During the next two years, as students transfer to UC, CSU, or other four-year institutions, more accurate numbers will emerge.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Spring 2007</th>
<th>Fall 2007</th>
<th>Winter 2008</th>
<th>Spring 2008</th>
<th>Fall 2008</th>
<th>Total</th>
</tr>
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<tr>
<td>Foothill</td>
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<td>Ventura</td>
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<td>Allan Hancock</td>
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<tr>
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<td></td>
<td></td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>42</strong></td>
<td><strong>57</strong></td>
<td><strong>9</strong></td>
<td><strong>124</strong></td>
<td><strong>18</strong></td>
<td><strong>276</strong></td>
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</tbody>
</table>

SMI Participation Projections
Due to the novel nature of the SMI there are no comparable programs at UC on which to base projections of participation. However, using data from a variety of sources – including the University of Texas UTeach program (on which many of the SMI program components are based) – a model of benchmarks was developed to track the growth of SMI towards an annual production goal of 1,000 teachers. The UC estimates below indicate the level of participation in Cal Teach/SMI in 2007-08, as compared to projected benchmarks showing the number of participants needed each year to reach its goals.
<table>
<thead>
<tr>
<th></th>
<th>CaT1</th>
<th>CaT2</th>
<th>CaT3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmarks</td>
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<td>441</td>
<td>306</td>
<td>1247</td>
</tr>
<tr>
<td>Estimates*</td>
<td>427</td>
<td>428</td>
<td>226</td>
<td>1081</td>
</tr>
</tbody>
</table>

* Does not include community college transfers.

If community college transfer students (i.e., about 100 students who have not yet transferred to UC) are included, then UC clearly approaches its benchmark target. Estimates of community college transfer students may be low, as prior to SMI there were only modest systemic efforts to connect UC teacher preparation with community college programs. Data collected on the emerging UC/Community College Joint Program indicate that it promises to grow to be a critical and substantial component of the SMI.

The growth model and corresponding benchmarks yield the following projections for overall SMI participation. The model includes both attrition and additions of transfer students. The “steady state” of slightly over 4,000 participants per year is the predicted program scale required to generate 1,000 teachers per year.

As mentioned above, although the SMI is a new and innovative program with little longitudinal data and few programs to which it might be compared, one can look to the University of Texas UTeach program as an example. This program shares goals and features with UC Cal Teach/SMI and has collected approximately ten years of data. The Texas program demonstrates the capacity of this model to expand the teacher corps far beyond the historic levels at a research university; like UC, the University of Texas has not historically served as a training ground for new teachers. However, the urgent need for more and better teachers and the presence of large numbers of talented math and science students led the Texas campus to assume further responsibility in this area.
Impact on UC Science and Mathematics Teaching Credentials

Because of the multi-year nature of credential programs, it is still early to measure the large-scale impacts of the SMI on UC’s math and science teaching credential production. Nonetheless, as mentioned above, many campuses have reported that initial increases are becoming apparent. Already about half of the UC campus’ credential programs have reported an increase in math and science students entering their program. Furthermore, these students either have participated in at least one SMI course or have mentioned that the increased attention and activity around math and science teaching on the campuses have made them more aware of the credential program options.

Because of the structure of UC education programs in past, the majority of UC students completing an undergraduate program in math or science have historically completed the final step of the credential process at another institution. In the past approximately one-third of UC students completed their undergraduate programs at a UC campus, one-third completed the credentialing work at a CSU campus, and another third completed the credential at an independent institution. In other words, UC students characteristically have completed their undergraduate science and math work at a UC campus and then taken the final step to the credential at another site.

Taking this pattern into consideration, the following chart shows historic data and projections for the growth in UC math and science teaching credentials over the next few years. SMI participant data suggests that the University will reach its goal of 1,000 credentialed math and science teachers as projected in 2010-11.
Quality and Retention in the SMI Program

The SMI model is intended not only to attract a new and larger cadre of math/science students into teacher education, it also aims 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 will be used not only to evaluate and monitor participants but to yield a rich understanding of the program components, as well as what is working and what is not.

This will be a state-of-the-art research and evaluation system of quality indicators and will take several years for SMI faculty and other leadership to develop. In the interim, the University is administering surveys of its student participants to learn about students’ levels of satisfaction with SMI and the likelihood that they will complete the program and the credential. Last summer 471 SMI students completed surveys. These surveys are used to provide feedback and information about the program and serve as basic quality indicators. It also reveals student perceptions of the value of the seminar and field experience components of the program. The survey data is summarized below.
Determining changes in the quality of preparation of math/science teachers trained through SMI presents a variety of challenges. One measure employed at University of Texas, Austin was to focus on the cumulative GPA of teachers. Before the UTeach program those students in the College of Natural Sciences who became teachers had below-average GPAs, perpetuating the idea that the math and science teachers were weaker academically. However, after implementing the UTeach program, this situation changed. The mathematics and science students in the UTeach program graduated at higher rates and had significantly higher GPAs than the average mathematics or science student.

An important part of the UC SMI model is the idea that providing an intellectually challenging and coherent program to recruit and prepare math and science teacher will attract a new pool of students who excel academically. Although we do not have sufficient longitudinal data at this stage to provide systematic numbers, early examples indicate that we are finding similar results to the UTeach outcomes. Namely, at UC Riverside in Fall 2007, a cohort of perspective math teachers had an average GPA of 3.12, whereas the average GPA among all mathematics majors during that time period was only 2.91.
Estimated Costs of SMI for 2007-08

In addition to the $1,125,000 provided by the State in 2007-08, the SMI has been supported by private donations and other monies.

The full cost of running the program in 2007-08 is estimated to be about $5,000,000. The program budget for 2007-08 is shown below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$729,000</td>
</tr>
<tr>
<td>Stipends for students</td>
<td>$651,000</td>
</tr>
<tr>
<td>Stipends for mentor teachers</td>
<td>$298,000</td>
</tr>
<tr>
<td>Other support costs</td>
<td>$1,677,000</td>
</tr>
<tr>
<td>Supervision, coordination, and administration</td>
<td>$1,600,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$4,955,000</strong></td>
</tr>
</tbody>
</table>

Please note that instruction is the cost of faculty salary and benefits for teaching the 1,085 students taking 65 sections of SMI-specific courses.

Stipends for students refer to the financial incentives provided to participants. Students were paid $600 for participating in a Cal Teach seminar and spending at least 30 hours (in a quarter/semester) in field experiences in K-12 classrooms.
Mentor teachers were paid $275 per student mentored in the SMI program. Mentor teachers were expected to meet with, observe, and give advice to their mentees.

Other support costs include paying for the TB tests, fingerprinting, and background checks required for anyone who works with students in public schools. Students also receive reimbursements for the travel expenses, educational supplies, and classroom materials they use in their K-12 work. This category also includes the costs of program recruitment and advertising (e.g., posters, fliers, mailings, websites, and advertisements in campus publications).

Coordinating, supervising, and placing students in classrooms paired with mentor teachers requires a considerable number of people. This category also includes administrative support and release time for program directors.

**Charting CalTeach/SMI’s Progress Toward Its Goals**

This final section of this report discusses SMI’s progress toward its stated goals. The program has now completed two years of operation. The chart below displays the program development steps completed thus far as well as projections for future development.

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. **Full-scale Program Operation, 2007**
   - Design Refinement

4. **First Class of Graduates, 2010**
   - Program Institutionalization

Cal Teach/SMI has very successfully navigated the first stages of its development, as the exacting review of the programs required to receive the NMSI grants for SMI vividly illustrates (a discussion of the grants received by UC Berkeley and UC Irvine appears earlier in this report). Cal Teach/SMI has forged new working relationships on campuses between math/science and education faculty and has found remarkable acceptance from math and science students, who are enrolling in the program courses in noteworthy numbers throughout the UC system.
As the trajectory of the program illustrates, Cal Teach/SMI is a complex, multi-step program requiring development over several years. It aims for a high degree of innovation, which at some campuses requires building the initial infrastructure and attracting personnel and funding for a completely new program, and at others means the change and reform of existing efforts. Because Cal Teach/SMI is also an academic program, it requires identification of specialized faculty and curricular approval of new courses and degrees. And because the teaching credential is a professional degree involving student experience in schools, K-12 teachers and leaders must be recruited and integrated into the program. Lastly, the program seeks to recruit students with a wide variety of career options and high levels of achievement into the teaching field.

The CalTeach/SMI program currently faces several challenges. First, it must raise additional funds to support the stipends being provided to student participants and mentor/master teachers. The enrollment successes of the program have seriously increased the need for new money for this purpose.

Second, as the Community College dimension of the program has grown over the past two years, its funding and organizational needs must be met. To a large extent, this element of the program has been supported through private grants, but as additional colleges come on board, staff needs and the demand for student stipends are rising.

Third, as the program approaches maturity, additional work on the final curricular elements of the degree must be developed and the organizational demands of a fully mature program must be met.

What has been tested over these past two-and-a-half years is whether students will find the Cal Teach offerings leading to a teaching credential to be an attractive option, and whether new interdisciplinary alliances between math/science and education can successfully forge a notably stronger preparatory curriculum for new teachers. The University is now positioned to show clear evidence that both these outcomes have been achieved. The challenge ahead is to institutionalize and expand these programs to meet California’s pressing needs for a larger and stronger teacher corps in math and science.