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Evaluation of the California Science Project

FINAL REPORT

Prepared for
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INTRODUCTION

The California Science Project (CSP) is one of nine discipline-focused professional development networks that comprise the California Subject Matter Projects (CSMP). Administered by the University of California Office of the President (UCOP) and housed on university campuses and county offices of education across the state, the networks are designed to assist teachers' development of the content-specific expertise and pedagogical skills necessary to help students meet the objectives outlined in California's K-12 academic standards and curriculum frameworks. To achieve these goals, the CSP, like all CSMP, provides professional development to teachers, develops teacher leadership, and creates and maintains discipline-specific networks of teachers and university faculty.

The CSP receives both state and federal funds through UCOP and receives additional support from local districts that use its services. In July 2003, the CSP received a special allocation of funds from the federal No Child Left Behind Act (NCLB) for the California Science Teachers Initiative (CASCITI) to improve science instruction in California. These funds were to be used to provide professional development for teachers who needed to achieve highly qualified status, and to serve schools that missed their targets for Adequate Yearly Progress. CASCITI also included the following additional goals: help teachers teach literacy through science, prepare teachers to meet the needs of English learners in science, improve the knowledge and qualifications of teachers who teach science—especially fourth- and fifth-grade teachers, and conduct research and evaluations that generate knowledge about effective instructional practices. These goals complemented the work the CSP had been doing for several years while responding specifically to the current needs of California's science teachers.

The Challenge

The Science Project is taking on a significant challenge in improving science education in the state. On the National Assessment of Educational Progress in 2005, only about one in every eight California students at the fourth and eighth grades scored at or above proficient in science. On the California Standards Test in 2005, approximately one-third of California fifth-graders tested below or far below basic in science. The picture is even more abysmal for specific subgroups: in 2005 only 16% of African-American fifth-grade students and 14% of Latino fifth-grade students scored at proficient or above in science.

The challenge is complicated by the nature of the state's teacher workforce. At the high school level in 2004-05, 10% of life and physical science high school teachers were underprepared—they had not yet completed their preparation and so had no preliminary credential. In addition, 20% of high school teachers who taught at least one physical science course were fully credentialed but not in physical science and 12% of life science high school teachers were fully credentialed but not in life science (Esch et al., 2005).

Overview of the CSP Evaluation

This evaluation describes the CSP's work from 2001-02 (the time of the last CSMP evaluation) to 2004-05. Because CASCITI is integrated into the ongoing work of the CSP, we do not attempt to disentangle the work done with CASCITI funds from the CSP's overall program. Accordingly, this evaluation examines the CSP's effectiveness both in meeting its goals under CASCITI and, more broadly, its mission from UCOP.[1] This report addresses the following research questions:

1. How is the CSP responding to the current policy context, including changes in funding and organizational pressures for fiscal efficiency?
2. What are the scope and scale of CSP activities? To what degree do CSP activities address the needs of teachers of English learners, low-performing schools, and underprepared teachers?
3. What is the nature of the professional development provided by the CSP, and to what extent is it consistent with the literature on high-quality professional development?
4. How does the CSP affect teachers' abilities to provide high-quality, standards-based instruction? How does the CSP affect teachers' abilities to provide high-quality, standards-based instruction for English learners?

The evaluation involved several data collection activities over 2 years (Exhibit 1). Most data collection was carried out in coordination with the larger evaluation of the CSMP. For example, the analysis of the internal data files in the Online Information System (OIS) was conducted for the CSMP as a whole and then broken down to look at Science Project data specifically. Details on the methodology can be found in Gallagher et al., 2005b).

[1] This study is one of three reports that evaluate the effectiveness of the CSMP to be completed by SRI International (SRI) under contract with the University of California. Please see Gallagher et al., 2005a; Gallagher et al., 2005b.

Exhibit 1
Evaluation Activities

Year 1	Year 2
• Review of prior research conducted on the CSMP • Review of CSMP internal data files and documents • Interviews with the CSP executive director, site leaders, and consultants • Observation of CSP professional development • Observation at a CSP site director meeting • Survey of site leaders	• Review of prior research conducted on the CSMP • Review of internal CSMP data files and documents • Interview with CSP executive director • Survey of participating teachers[2] • Case studies of participating elementary teachers

Report organization

This report is organized into five sections, including this introduction. The next section discusses important budget changes that have affected the CSP. The following section describes the scope and scale of the CSP, including participants served and types and length of events offered. The next section addresses the effectiveness of the CSP. The report concludes with a summary of findings and implications for the work of the CSP.

BUDGET

The CSP faces a persistent challenge as it tries to adapt to constantly shifting financial contexts. In this section we describe how the CSP responded to changes in funding over the last few years.

Funding 1999-2000 to 2004-05

The CSMP began in 1990 under state legislation (SB 1882, Swofford) that authorized the creation of a network of nine subject-specific professional development providers. Since its inception, the state has provided, and UCOP has administered, the core funding for the CSMP. Over the past few years, the CSMP, much like the state's economy, experienced a boom and bust funding cycle. In the early 2000s, as part of a larger effort to improve teacher quality in California, the state dramatically increased CSMP allocations from $15 million in 1999-2000 to $35 million in 2000-01. Yet by 2003-04,

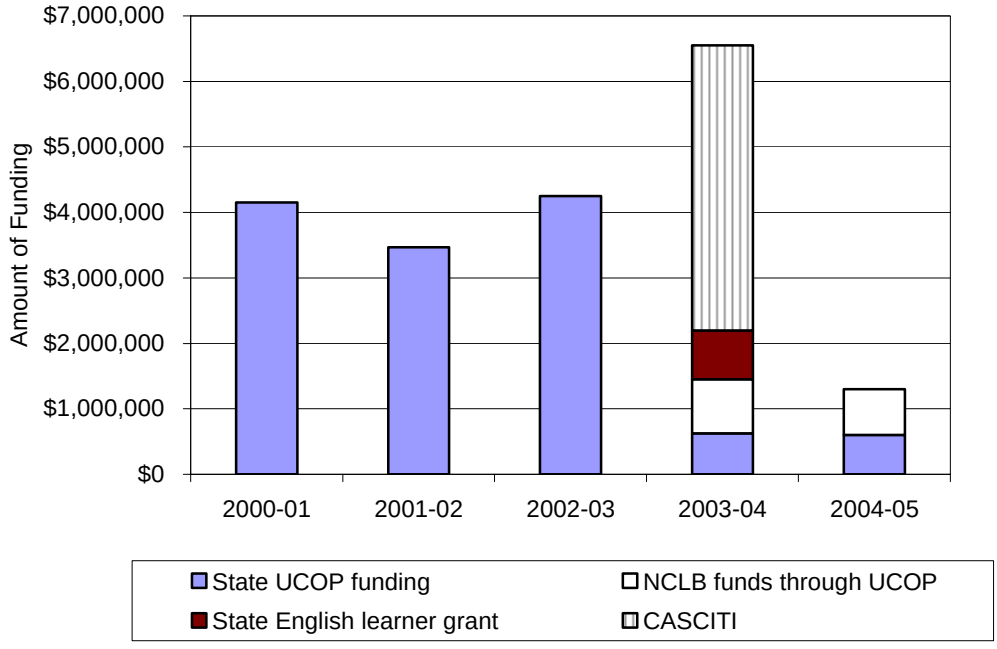
[2] The CSMP teacher survey was designed with subject-specific forms. Thirty-eight teachers responded to the Science Project form of the survey, representing a response rate of 40% for the CSP analyses.

state funding for the CSMP declined precipitously, falling from $35 million to $5 million (and has remained at that level through 2005-06). A percentage of this decreased allocation was offset by an annual federal contribution of $4.4 million from NCLB beginning in 2003-04 (and continuing through 2004-05).

Funding for the CSP fluctuated along with that of CSMP as a whole. However, for the CSP, cuts in general state funding were offset in 2003-04 by additional state dollars to focus on English learners and the addition of the CASCITI grant.

As Exhibit 2 shows, the state allocated approximately $4.1 million to the CSP in 2000-01, with the allocation declining slightly to $3.4 million in 2001-02. State support peaked at $4.3 million in 2002-03. In 2003-04, the CSP received $1.5 million in core funding that included a mix of state ($625,000) and federal NCLB ($825,000) dollars; an additional $750,000 came from a one-time state allocation for work with English learners. The sharp decline in funding through UCOP, however, was offset by the $4.3 million CASCITI grant. In September 2004, CASCITI ended, and the state allocation dropped to approximately $600,000, with an additional $700,000 of NCLB funding also provided through UCOP.

Exhibit 2
Funding for the CSP 2000-01 through 2004-05



Data source: UCOP (2004)

Reducing Effects of Funding Fluctuations

The allocations in Exhibit 2, which show a spike in funding in 2003-04 and a dramatic decline in 2004-05, mask a more complicated reality. Some sites are able to manage budgetary fluctuations by allocating resources flexibly and seeking additional external funding.

Managing budgets resourcefully

Some sites resourcefully used the overlap in fiscal years and flexibility in spending requirements from different various funding sources through a system of "carry forward" and "recharging." These approaches help them weather unpredictable budget allocations. Site spending of CASCITI funds is an excellent example of how these financial management strategies work.

CASCITI funds, allocated to the CSP in 2002, were required to be spent by September 30, 2004. A variety of circumstances, however, including the recall of former Governor Gray Davis, led to a delay in sites' receipt of funds until the late spring of 2004. Uncertain when funds would arrive, some site directors found their ability to plan and deliver programs during 2003-04 impeded, although they were able to use funds from the state and other sources to temporarily cover the costs of professional development during 2003-04. When CASCITI funds finally arrived in spring 2004, they were used for institutes and other professional development activities offered in the summer and early fall of 2004. Site directors then also used CASCITI funds to "recharge" for events offered earlier in 2003-04; they could then "carry forward" funds they had earlier allotted for events offered during 2003-04 to support professional development in 2004-05. Thus, some sites were able to navigate dramatic changes in funding by using flexibility available from various funding streams. While sites varied in the degree to which they were able to "recharge" and "carry forward" CASCITI funding, their ability to avoid "feast or famine" budgeting was critical for the efficient and effective expenditure of funds.

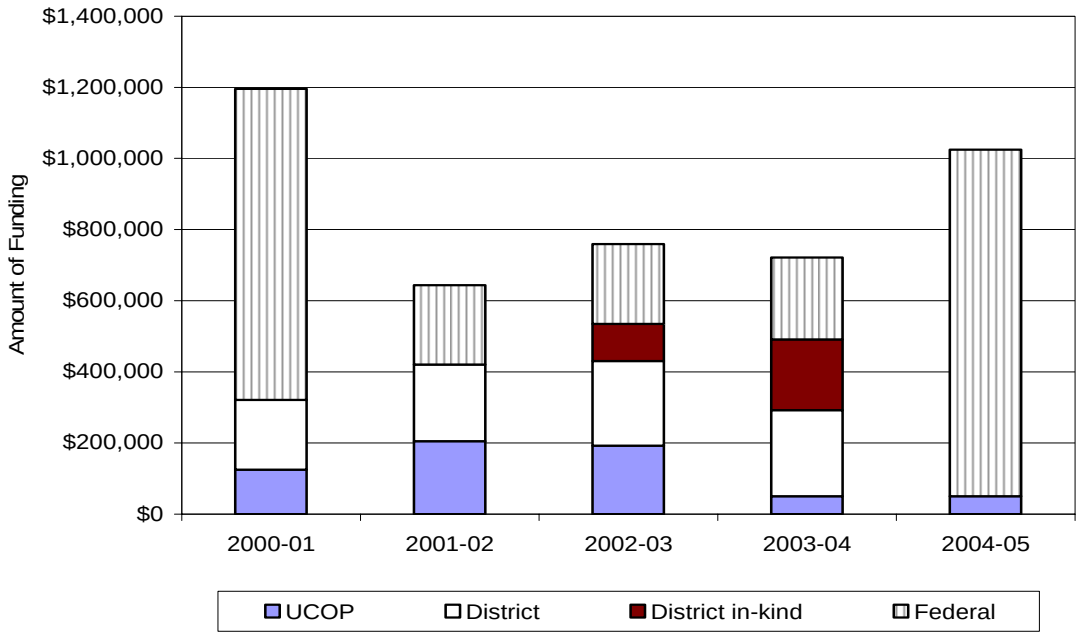
Raising funds from external sources

To address the changing budget situation, sites also sought to secure external funding through major grant-writing activities. In addition, the CSP encouraged sites to adopt a "fee-for-service" model under which districts or participating teachers paid a fee for professional development activities. For many sites, these efforts were not new; they had been applying for outside funding for years. Because some sites proved more successful

than others in tapping into external funds, state budget cuts produced quite uneven impacts across the CSP.

Two local science sites illustrate this differential impact. The first site began as an NSF-funded science education project in the late 1990s. As Exhibit 3 shows, site funding varied substantially between 2000-01 and 2004-05, ranging between $600,000 and $1.2 million. Funding directly from UCOP rose from $125,000 in 2000-01 to about $200,000 in each of the next 2 years before dropping precipitously to $50,000 (funded by CASCITI) in 2003-04. The site compensated for these losses, however, by securing funds from partner school districts and the federal government. In 2004-05, for example, the site partnered with a local district and obtained a California Mathematics and Science Partnership award.

Exhibit 3
Funding Trends for Site 1 from 2000-01 to 2004-05



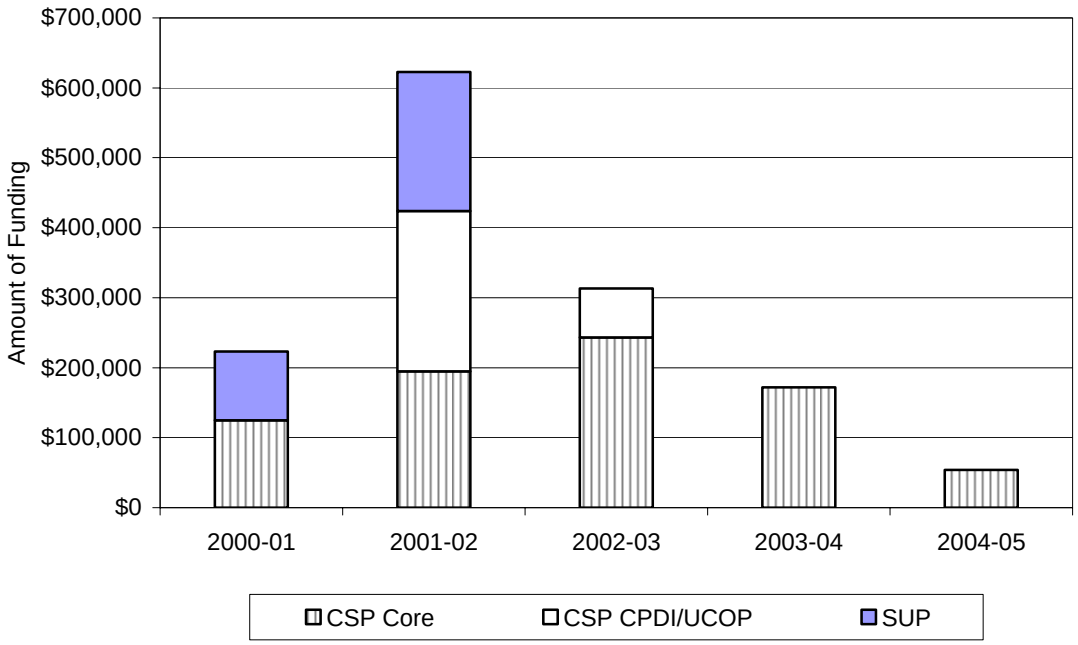
Data source: Records from Case Study Site 1 (2004).[3]

A second site demonstrates the perils of relying on a single funding source. There, funding increased between 2000-01 and 2001-02, but was reduced by more than 70% in 2003-04 (Exhibit 4). All of the site's funds came from the state—a combination of the School/University Partnership (SUP), core funding through CSP, and the California Professional Development Institutes (CPDI). Unless this site can find other sources of

[3] The specific source is not cited so as to protect the anonymity of the participating site.

funding, it may struggle to continue providing science professional development to teachers.

Exhibit 4
Funding Trends for Site 2, 2000-01 to 2004-05



Data source: Records from Case Study Site 2 (2004).[4]

SCOPE AND SCALE OF THE CSP

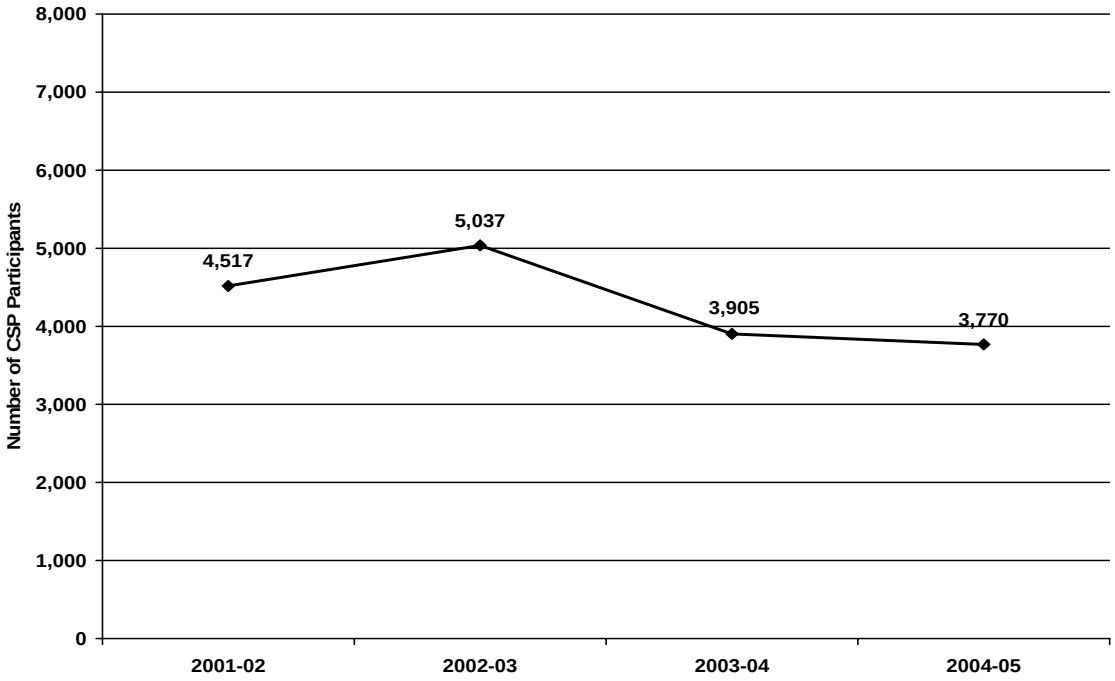
With funding coming from a variety of sources—each with its own targets for professional development—the CSP is charged with reaching multiple audiences. Responding to California's standards-based accountability reforms, the CSP, like the CSMP in general, is intended to place greater emphasis on service to the state's lowest-performing schools, to the teachers with the toughest student assignments (including large proportions of English learners), and to teachers who lack adequate subject matter preparation. NCLB added two new constituencies: teachers who needed to achieve highly qualified status, and schools that missed their targets for Adequate Yearly Progress. CASCITI targeted teachers working with English learners in science, and teachers who needed to improve their knowledge and qualifications to teach science—especially fourth- and fifth-grade teachers. In this section, we assess the characteristics of the participants served, as well as the content and format of events offered.

[4] The specific source is not cited so as to protect the anonymity of the participating site.

CSP Participants

Since 2001-02, the number of CSP participants has dropped approximately 17% from over 4500 to fewer than 3800 (Exhibit 5). This overall decline likely reflects the effects of budget cuts. The number of participants, however, does not directly mirror budget fluctuations—in part because of site directors' abilities to balance funds across years and raise money from external sources.

Exhibit 5
CSP Participants, 2001-02 through 2004-05



Data source: OIS (2005).

CSP participants, like the CSMP as a whole, are primarily classroom teachers. For the school year 2004-05, more than 2,799 of the nearly 3,770 participants (74%) were classified as classroom teachers (Exhibit 6). In addition, school administrators sometimes accompany teachers to CSP activities. The OIS shows that about 2% of participants are principals, vice principals, or some other type of administrator. Students, both undergraduates and teacher preparation candidates, make up another 4% of participants.[5]

[5] Nine percent of the participants are listed as "other," a category that includes school counselors, curriculum specialists, instructional aides, and college professors. In addition, we have no classification data on 399 participants, or 11% of the total number of CSP participants captured in the OIS.

Exhibit 6
CSMP and CSP Participants by Type, 2004-05

Type of Participant	CSMP Number (Percent)	CSP Number (Percent)
Teachers	30,702 (73%)	2,799 (74%)
Administrators	860 (2%)	70 (2%)
College Students	1,136 (3%)	158 (4%)
Other	3,862 (9%)	344 (9%)
Missing Data	5,261 (13%)	399 (11%)
All	41,821	3,770

Data source: OIS (2005).

Teacher Characteristics

In this section, we report on the CSP's ability to reach their multiple intended audiences: fourth- and fifth-grade teachers, teachers of English learners, teachers who need to meet NCLB's highly qualified requirement, and teachers in low-performing schools.

Fourth- and fifth-grade teachers. CASCITI placed special emphasis on fourth- and fifth-grade teachers who teach science. Reflecting an elementary focus, a majority of CSP participants (68%) are elementary school teachers (though it is unknown how many teach fourth or fifth grade specifically). In fact, of all the Projects, only one—the Reading and Literature Project—serves a greater percentage of elementary teachers than the CSP does.

Teachers who need to meet NCLB's highly qualified requirement. Another of the CSP's roles involved serving teachers who need to become highly qualified under NCLB. Among those who are not highly qualified in the state are teachers who have not yet received their preliminary credential and are not in intern programs. This group constitutes about 3% of the population of California teachers. Estimates of CSP teachers who are not subject-matter competent range from 4% to 13%.

Other non-NCLB-compliant teachers include veteran credential holders who have not passed a subject-matter test or majored in a recognized content area. An example of such a teacher is a veteran elementary teacher who majored in liberal studies. These

experienced teachers can gain subject matter competency either by taking a subject matter test or by documenting their qualifications through the High Objective Uniform State Standard of Evaluation (HOUSSE). Each district sets specific HOUSSE regulations, but the guidelines generally include documentation of participation in a wide variety of activities (e.g., undertaking content-based professional development, serving as a department chair) that policy-makers assume either require or provide content area expertise.

Many CSP sites provided professional development and training programs for teachers who needed to achieve highly qualified status. Some sites offered CSET test preparation for teachers who had not yet received a preliminary credential in science while others provided content-rich professional development activities that teachers could apply towards HOUSSE.

Regardless of the formal status of teachers vis-à-vis federal regulations, teachers pursued CSP training to develop their content knowledge. Because college courses do not necessarily align with California's K-12 science content standards, teachers who have an undergraduate science major may lack some relevant knowledge, hindering their ability to teach science accurately or in depth. Gaps in content knowledge may be most common for elementary teachers because multiple-subject preparation programs, charged with providing an enormous breadth of knowledge, may leave them lacking critical concepts and skills. One case study elementary teacher, for example, never took a class in methods for teaching science as part of her credential program. She participated in the CSP to build her skills in teaching science aligned to standards. As that example demonstrates, even teachers who meet the state's definition of highly qualified access the CSP's resources to improve their content knowledge.

Teachers of English learners. The 2001 RFP specified that sites should emphasize working with teachers of English learners. Across California, 25% of all students are English learners. Reflecting its focus on English learners, CSP teachers, on average, have 43% English learners in their classes. Twenty-one percent of CSP participants reported having 80% or more English learners students in their classes.

Teachers in low-performing schools. Since 1998, the CSMP have focused their work more on low-performing schools and districts—a mandate under both state and federal funding. Specifically, the CSMP target teachers working in schools ranked 1-4 on the state's Academic Performance Index (API). An analysis of OIS data for 2004-05

shows that 41% of CSP teacher participants taught in low-performing schools, [6] compared to 43% of teachers who work in low-performing schools statewide, suggesting that the CSP did not attract a much higher proportion of teachers from low-performing schools than exists in the overall teacher population.

In all, the CSP has reached most of its targeted audience. Though it has been less successful in providing service to the state's lowest-performing schools, the CSP has reached teachers of English learners, teachers needing to improve their content knowledge, and elementary school teachers (an indication that the CSP is reaching fourth- and fifth-grade teachers).

Format of CSP Activities

The CSP offers many different types of professional development activities, including institutes, follow-up, series, coaching, inservices, and others.[7] The median length of all types of activities increased in 2004-05, and for all types of activities except coaching, marked the longest professional development offered by the CSP over the past 4 years. In 2004-05, institutes were substantially longer than other activities and were nearly 8 times as long as the median institute in 2001-02 (Exhibit 7).

Exhibit 7
Median Length of Professional Development Activities in Hours, 2001-02 to 2004-05

	Institute	Follow-up	Series	Coaching	Inservice	Other
2001-02	8.0	8.0	4.0	6.5	2.0	2.0
2002-03	31.0	8.0	4.0	40.0	4.0	2.0
2003-04	40.0	8.0	4.0	3.0	5.0	3.0
2004-05	67.0	24.0	12.5	17.0	12.25	23.0

Data source: OIS (2005).

[6] Twenty-seven percent of teacher respondents were in schools with missing API rank information.
[7] The OIS allows site directors to enter their activities into the database in any one of 19 categories, including a category called "other." We combined somewhat similar types of offerings into six categories: institute, follow-up, series, coaching, inservice, and other. Institute includes the OIS categories of invitational institute, open institute, and mini-institute; series includes the categories of partnership series and workshop series; inservice includes the categories of partnership inservice, inservice, workshop, and conference; "other" includes the categories of academy, action research, conference, committee or planning meeting, partnership meeting, other, retreat, or study group. Note that because the OIS does not require sites to use consistent definitions in categorizing activities in the OIS, what one site director may define as a conference, another may define as a retreat.

Coinciding with the increase in median length of all types of professional development, 2004-05 marked a rebound in the number of contact hours that participating teachers spent in CSP activities (Exhibit 8). From 2001-02 to 2003-04, the percent of CSP participants attending CSP events for fewer than 40 hours increased, and the percent attending CSP events for 80 or more hours decreased. In 2004-05, that trend began reversing.

Exhibit 8
Contact Hours per Teacher, 2001-02 to 2004-05

	1 to 39 Hours	40 to 79 Hours	80 or More Hours
2001-02	1,215 (48%)	629 (25%)	726 (28%)
2002-03	1,505 (63%)	411 (17%)	477 (20%)
2003-04	859 (65%)	382 (22%)	221 (13%)
2004-05	1,576 (56%)	528 (19%)	695 (25%)

Data source: OIS (2005).

The recent increase in the percent of teachers attending CSP events for 80 or more hours may reflect the simultaneous increase in the numbers of teachers attending CSP institutes, which are characterized by their greater length. From 2001-02 to 2003-04 the percent of teachers attending institutes decreased from over half of all CSP participants (52%) to fewer than one-fifth of participants (19%). In 2004-05, the trend reversed and nearly one-third (32%) of CSP participants attended institutes.

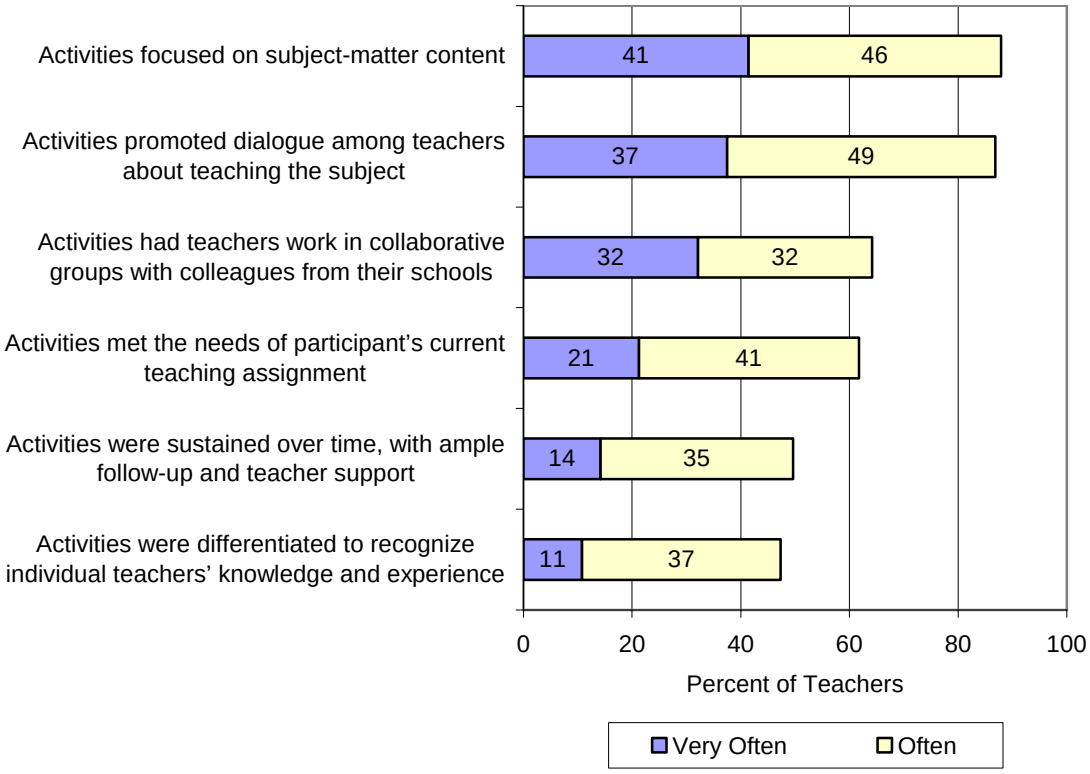
The increase in the median length of CSP professional development, contact hours per teacher, and percent of teachers attending institutes has thus far been apparent for one year only, 2004-05. A look at the current school year, 2005-06, and beyond will determine whether the CSP's more intensive professional development is an ongoing trend or an anomaly.

Quality of CSP Professional Development

Previous research has identified characteristics of effective professional development, which in addition to ongoing activities that are sustained over time, include collective work, content focus, active learning, and differentiation (Birman, Desimone, Porter, &

Garet, 2000; Garet, et al., 1999; Kennedy, 1999; Loucks-Horsley, 1999). In general, teacher participants report that CSP professional development reflects these characteristics (Exhibit 9).

Exhibit 9
Teachers' Reports of Elements of High Quality Professional Development Experienced through the CSP



Data source: CSMP Teacher Survey (2005).

Participants reported that the CSP is more successful at incorporating some elements of high quality professional development than others. Nearly nine in ten participants reported that the CSP focused on subject matter content often or very often (87%) and promoted dialogue among teachers (86%). Just under half reported that the events they attended were sustained over time with ample follow-up (49%) or were differentiated to recognize individual teachers' knowledge and experience (48%).

CSMP participants who received high quality professional development reported more benefits to their content knowledge and pedagogical skills than CSMP teachers who did not (Gallagher et al., 2005b). In the following section, we discuss the benefits reported by CSP teachers.

TEACHER REPORTED OUTCOMES

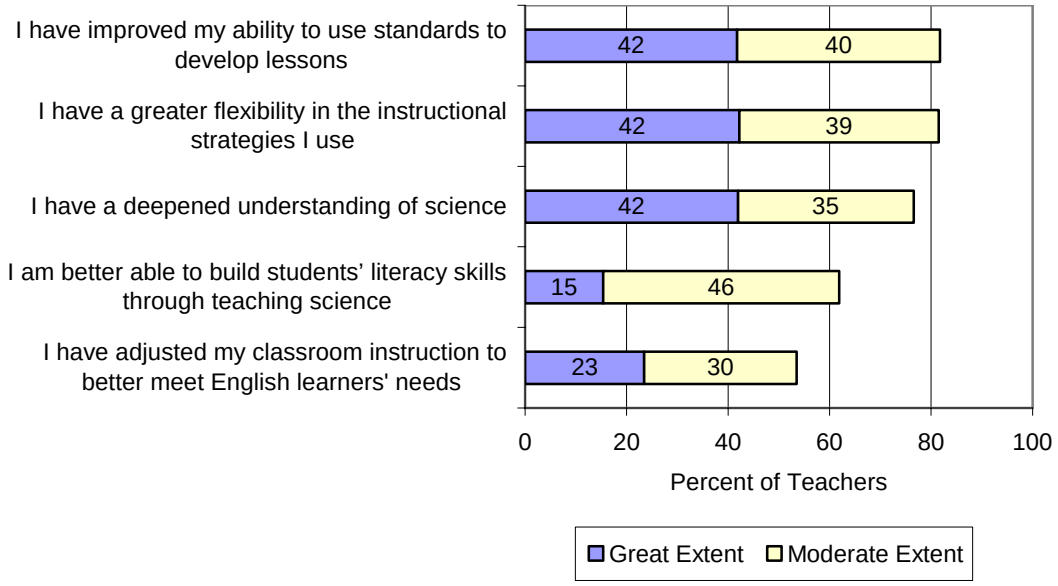
The ultimate goal of the CSP is to improve student learning by developing teachers' skills and knowledge and, consequently, their practice. In this section, we present teacher reports on the CSP's effects on their teaching and their students' learning, as well as the barriers to successful implementation of what the CSP taught participants during professional development activities.

Impact on Instruction and Content Knowledge

Nearly all teachers reported that the activities offered by the CSP improved their knowledge and skills. Specifically, 73% reported that the activities were very useful for their professional growth, and an additional 21% reported that the activities were useful.

Teachers reported that their participation had positive effects in specific areas that reflect core CSP goals (Exhibit 10). Teachers reported, for example, that their CSP participation improved their ability to use standards in developing lessons (82%), increased the range of their instructional strategies (82%), and deepened their understanding of science (77%). Teachers also reported that the CSP improved their ability to meet the needs of English learners by building literacy skills through science instruction (62%) and adjusting instruction to meet English learners' needs (53%).

Exhibit 10
Teachers' Reports of the Extent to which CSP Affected Their Knowledge and Skills



Data source: CSMP Teacher Survey (2005)

As previously discussed, the CSP's core work of improving teachers' subject matter knowledge and ability to teach it is especially critical in science because of gaps in the preparation of some teachers, even those who are considered highly qualified under NCLB. The CSP addressed a critical need for those teachers whose preparation programs did not require any courses on teaching science. Similarly, for teachers who struggled to understand or appreciate science during their K-12 education, CSP professional development helped demystify the content and boost their confidence in teaching science. One stated, "Science is definitely not my first love, but now I definitely am more interested in teaching science, and learning the strategies. The more I do it, the more I know how to teach it better." Such teachers reported that their participation led them to teach science more frequently than they otherwise would have.

Teachers also commented specifically on the CSP's effectiveness in helping them meet the needs of English learners through science instruction. One teacher noted:

> I think that [my local CSP site] has provided an effective and necessary support system for elementary teachers like me, who feel that science instruction is very important for not only second language learners but for all elementary students. I know my science instruction has helped my students to develop academic vocabulary, science concepts, writing, and a positive, inquisitive attitude towards science. It also provides ample opportunities for [teacher] collaboration [and] reflection.

Another commented:

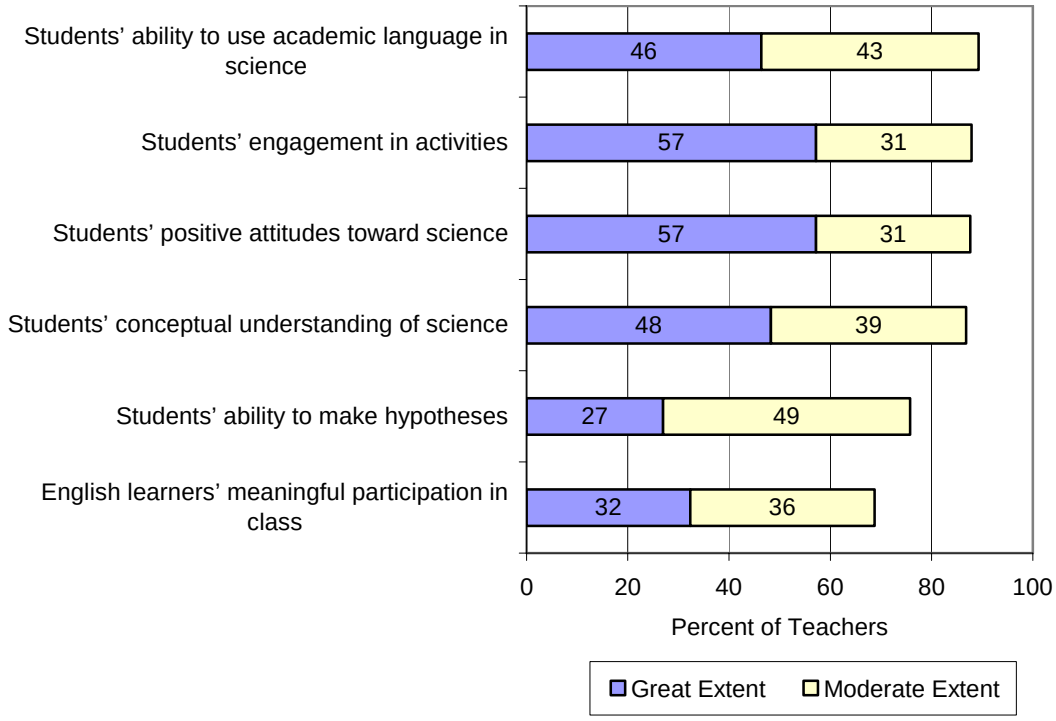
> I have received a lot of good material and ideas from [my local site] to teach science. Previously I participated in [professional development from another provider] for 2 years and I learned how to include more inquiry-based science strategies in my science instruction. Where [my local site] has been more effective is that the instructor includes very useful ELD [English language development] techniques to use throughout our science instruction.

Overall, teachers reported contributions from CSP participation to their own knowledge, skills, and practices.

Contributions of CSP Participation to Student Learning

In addition to reporting that CSP participation improved their practice, teachers also indicated that their participation led to improvements in student achievement. Teachers believe the CSP is effective both in general and in regards to specific outcomes critical for English learners' success (Exhibit 11).

Exhibit 11
Teachers' Reports of the CSP's Effects on Student Outcomes



Data source: CSMP Teacher Survey (2005).

Teachers report that their participation in the CSP had a moderate or great effect on students' engagement in activities (88%), positive attitudes towards science (88%), conceptual understanding of science (87%), and ability to make hypotheses (76%). Teachers also reported benefits that are especially important for English learners, including students' ability to use academic language in science (89%), and English learners' meaningful participation in class (69%).

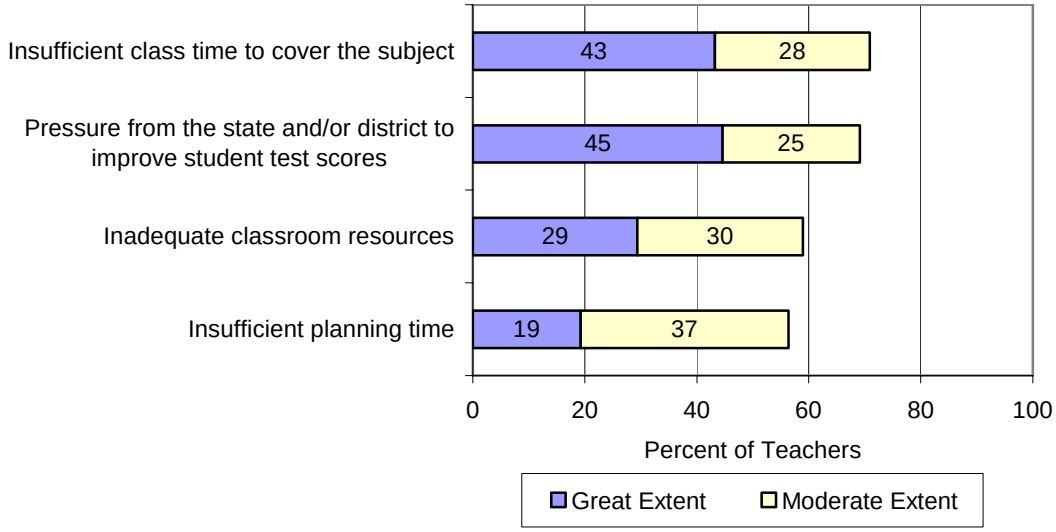
Internal evaluations previously conducted at two CSP sites lend support to teachers' assertions that their participation benefits their students. Several CSP sites offer "academies," a format of professional development in which teachers are taught strategies for teaching science to English learners and then practice implementing these strategies under the guidance of coaches during summer school. In a series of studies of the effectiveness of the summer academies offered by the Monterey Bay Science Project, researchers (Stoddart et al., 1999; Oliver, 2000; Stoddart and Clinton, 2002) found positive relationships between teachers' participation in the CSP and student achievement

on various standardized and locally developed measures.[8] A separate study found a positive relationship between teacher participation in the Valle Imperial Science Project science kit program and students' achievement on the Stanford Achievement Test 9th Edition in science, reading, and mathematics, and a locally developed measure of writing. Furthermore, the positive effects on students increased for every year that they had a teacher who participated in the CSP (Amaral, Garrison, and Klentschy, 2002).

Barriers to Implementing CSP Training and Remedies

Teacher reports and internal CSP evaluations strongly suggest that the Project has positive effects on participating teachers and their students. Other data, however, suggest that the CSP's ability to positively affect students can be hindered by teachers' instructional contexts. Teachers reported that several factors presented a moderate or great challenge to their ability to fully implement what they learned through CSP participation (Exhibit 12). Specifically, teachers report that insufficient class time to cover science (71%), pressure to improve student test scores (69%), inadequate classroom resources (59%), and insufficient planning time (56%) impede their ability to implement what they learned from the CSP to a great or moderate extent.

Exhibit 12
Barriers to Implementing what Teachers Learn through CSP Participation



Data source: CSMP Teacher Survey (2005).

[8] The Stoddart (1999) and Oliver (2000) studies were conducted on a program that did not occur under the auspices of the CSP. We include these evaluations here, however, because the program evolved into the Monterey Bay Science Project in 2000, and the site continues to use many of the strategies evaluated in the study.

Case study data suggest that barriers to implementation frequently stem from the same source—a state accountability system that gives a relatively low weight to student performance in science when calculating a school's API (and therefore, the determination of whether or not schools are making Adequate Yearly Progress under NCLB). Some schools have responded to the pressure to increase their test scores by focusing almost exclusively on reading/language arts and mathematics—subjects heavily weighted in API calculations—largely eliminating instruction time for science (and other subjects). As one elementary teacher reported, "If you like science, you figure out how to squeeze it in. If not, you don't teach science." In fact, it was difficult to recruit comparison teachers for some of our case study sites because teachers who had not participated in the CSP rarely taught science.

The CSP addresses this challenging context by providing professional development that includes information on how to integrate science instruction with literacy, writing instruction, and English language development. Teachers we interviewed found such training effective, but many still struggled to use it regularly because school mandates to use highly a structured reading curriculum left little room to teach literacy through science. One teacher stated:

> We spend 3 hours on Language Arts [and] 1 hour on math, leaving 2 hours a week for science OR social science. So in both of the areas, there's so much more I could be teaching—more I could do. I definitely see where I could be using this [Science Project English language development] training, but every year I'm learning where I can fit it in.

Some schools' lack of emphasis on science also meant that many teachers had trouble obtaining materials when they tried to conduct a hands-on lesson. In some schools the lack of materials reduced the effectiveness of another CSP strategy for making training more applicable to teachers in their contexts—basing professional development activities on adopted curriculum. At one site, for example, professional development activities introduced teachers to the materials available in the FOSS kits their schools had purchased; however, schools did not keep the kits stocked. Consequently, teachers either had to buy materials out-of-pocket, or make arrangements to check out supplies from one of the district's science centers, which were closed outside of school hours. Some CSP sites addressed teachers' need for instructional resources by providing materials for teachers to check out or sharing ideas for hands-on lessons based on inexpensive and readily available materials.

While science's comparatively low weight in API calculations disadvantages the subject, the addition of the fifth-grade science exam in 2004—covering fourth- and fifth-grade standards—has drawn some attention to the weaknesses in many fourth- and fifth-grade teachers' preparation to teach science to the state's standards. One of CASCITI's top priorities involved responding to these teachers' needs, and sites began offering professional development geared specifically toward those grade levels. According to the site directors, the new assessment increased teacher and district interest in science professional development for elementary teachers. One noted, "For the first time since the SAT-9 was instituted, administrators were supportive of fourth- and fifth-grade teachers pursuing professional development in science."

Helping teachers to prepare their students for the test offered an opportunity and a challenge for the CSP. One site director described the confounding effects of the pressure to improve student performance in reading/language arts and mathematics, and the recent addition of the fifth-grade science test as follows:

> Teachers are feeling increasingly pressured by the push to increase reading and math scores on standardized exams. This, coupled with the adoption in our district of scripted reading and math programs, has significantly reduced the time available for teachers to teach science. At the same time teachers at the fourth- and fifth-grade levels are pressured by the science assessment. Despite having little time to teach science, and students who have had decreased access to science learning as the reading and math pressures have increased, the 4/5 teachers are expected to adequately prepare their students for this assessment. Many are panicked. As a result, we have had an increase in the number of 4/5 teachers applying to our programs—with the goal of learning how to implement standards aligned instruction for their students.

In addition, according to site directors, fourth- and fifth-grade teachers often lacked the content knowledge necessary to teach their grade-level standards effectively. To address this shortcoming, the CSP designed offerings to provide teachers with in-depth knowledge of the content in state standards as well as pedagogical strategies for teaching that content. One site, for example, offered institutes covering fourth- and fifth- grade standards in earth, life, and physical science content on a rotating basis.

CSP site directors also realized that lower elementary teachers should also be teaching science and many of them have knowledge and skill gaps similar to fourth- and fifth-grade teachers. Events tailored to fourth and fifth grade dominated many sites' elementary offerings and teacher comments suggest that sites have not succeeded in adequately differentiating professional development for teachers in other grades. As one teacher noted, "I had a hard time getting information and material for kindergarten.

Information tends to be more focused for upper grades and high school." Many teachers attended CSP events in hopes of learning specific activities to use in their classrooms. For these teachers, the lack of differentiation proved problematic, especially if they did not have the science background or instructional resources to apply the broader ideas presented by the CSP to their teaching assignment.

In sum, while teachers report positive effects on their knowledge and skills and on their students' outcomes as a result of their participation in the CSP, the contexts in which teachers work affect their implementation, as does the relevance of the training to individual teachers' needs.

CONCLUSIONS

Recent test scores indicate that California's student performance in science is abysmal, especially for poor and minority students. The CSP addresses this problem directly by working with teachers to improve their content knowledge and their teaching skills. The Project places special emphasis on reaching teachers in low-performing schools, teachers of English learners, and upper elementary teachers. Participating teachers report that CSP's professional development is of high quality, helps to improve their practice, and ultimately benefits their students.

Continuing to reach the state's teachers will, however, be a challenge. The number of teacher participants has declined over the past few years and may drop further given projected state funding levels. To accommodate these funding shortfalls, local sites will need to seek additional external funds, including fee-for-service arrangements.

The CSP also will have to continue to grapple with the disincentives for schools and teachers to focus on science created by an accountability system focused on language arts and mathematics. The addition of a fifth-grade science test has raised the visibility of science. Yet, the limited content knowledge of elementary teachers combined with the restricted time available for teaching science in the elementary grades limits the potential impact of CSP professional development.

So far the CSP has adapted to its new environment and made progress in meeting the challenges of reduced funding and the changing accountability system. Even within its new context, its commitment to enriching teachers' subject matter knowledge and deepening their pedagogical skills has not wavered. While the CSP is equipped to negotiate the challenges ahead, sites will need to marshal their resources to successfully address California's needs.

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