# The Status of Science Education in Bay Area Elementary Schools

Research Brief

LHS UC Berkeley

WestEd

## Science Education

California, including the San Francisco Bay Area, is home to much US innovation in science and technology. Recent national reports have illuminated the importance of science education in the elementary grades and described concerns for US leadership in science,[1] the importance of fostering interest in science early in life,[2] and issues with promoting high quality science instruction in the elementary grades,[3] nationally,[4] and in California.[5]

At the same time, this region produces inadequate achievement results among its students. Results of the *2005 National Assessment of Educational Progress* 4th grade science test indicate that California ranked 2nd lowest of all states on eighth grade science achievement, only above Mississippi. During spring 2007, results on the 5th grade California Standards Test (CST) in Science indicate that only 37% of California students and approximately 46% of Bay Area students scored proficient or above.[6] This means that even in the Bay Area, over half the 5th graders are failing to reach proficiency in science. Analysis of these test score results alongside demographic information suggests that those students from ethnic or racial groups who have traditionally been underrepresented in science fields score lower than their peers.

The results of a study[7] examining the status of science education in Bay Area elementary schools offer some insights about why students are not performing well in science in this region. Study findings suggest two interdependent reasons for these achievement results. First, the current status of science education is weak: science education is of inconsistent and often poor quality; Bay Area schools spend too little time teaching the subject; and many teachers are unprepared to teach science. Second, the current status of the efforts to improve science education is also weak: public educational policy (national, state, and often local) does not adequately address the importance of science education and often presents structural barriers to the improvement of science instruction. Fortunately, many schools and communities would like to improve these conditions. These and other ideas are explored in the following *Research Brief*.

## Limited Time for Science

*Teachers and districts report that a limited amount of time is spent on science education in Bay Area elementary schools.*

Eighty percent (80%) of K–5th grade multiple-subject teachers who are responsible for teaching science in their classrooms reported spending **60 minutes or less per week** on science, **with 16% of teachers spending no time at all on science**. Figure 1 displays related teacher survey results by grade band in greater detail. Another way of looking at these data reveals that students receive an average of 60 minutes of science instruction per week. This estimate is considerably lower than the 125 minutes per week reported as a result of a national survey[8] conducted in 2000.

District office estimates were more optimistic, indicating that 50% of elementary school classrooms spend 60 minutes or less per week on science; these estimates include those districts with science resource teachers.

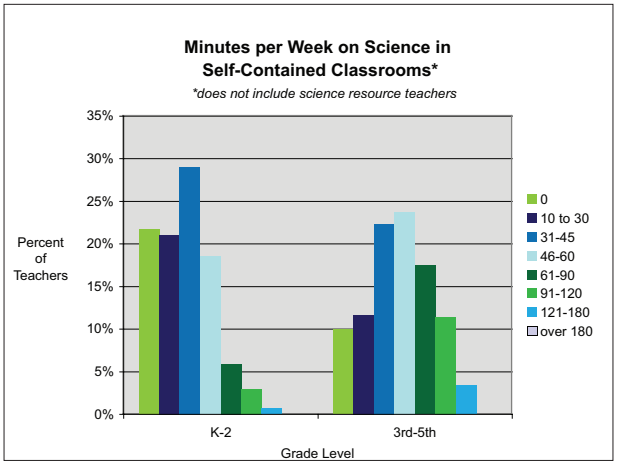


**Figure 1**

According to both teachers and district office personnel, about 80% of all elementary school students receive science instruction 3 times per week or fewer, with the majority of students receiving 2 days or fewer.

Echoing a recent national study,[9] district representatives who responded to our survey and participated in interviews reported that a diminishing amount of time has been spent on science since the enactment of *No Child Left Behind (NCLB).* Those districts with schools in *Program Improvement* status, due to their prior language arts and mathematics test results, report little to no time for science at all. In a few exceptional circumstances (special programs, community priorities), individual schools go against that trend, focusing adequate time and attention on science instruction.

## Little Teacher Preparation

*Many teachers feel less prepared to teach science than they do to teach other subjects, and there are few opportunities available to improve their preparation.*

Teachers who teach science in self-contained classrooms indicate that they feel least prepared to teach science as compared to the other core subjects. This finding is consistent with findings from a national survey[10] conducted in 2000. Figure 2 depicts Bay Area study results indicating that 10 times as many multi-subject teachers do not feel adequately prepared to teach science as compared to the same teachers' feelings of preparedness in literacy and mathematics.

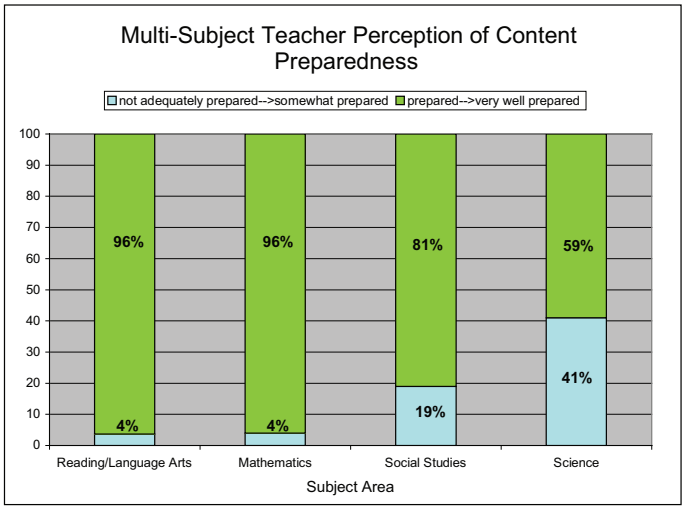


**Figure 2**

Science resource teachers, who provide science instruction in approximately 15% of the districts who responded to our survey, are more likely to feel prepared to teach science than are multi-subject teachers. Yet 16% of science resource teachers still indicate that they feel only somewhat or not adequately prepared to teach science. Interestingly, this means that some teachers primarily assigned to teach science feel less prepared to teach science than multi-subject teachers feel to teach reading/language arts or mathematics.

At the same time that teachers feel under-prepared in science, the region is challenged by the limitations of its teaching force. California schools average 12% new teachers (1st and 2nd year) while 1 out of 7 (14%) Bay Area teachers have been teaching less than 2 years. In addition, 16 Bay Area school districts (accounting for 20% of the region's students) employ a teaching force including 20–35% 1st and 2nd year teachers.

Lack of preparation and high teacher turnover rates render professional development (PD) opportunities in science critical. Few such opportunities exist within the school system, and few teachers access those offered elsewhere. Most County Offices of Education provide minimal or no science PD; districts indicate that, over the past year, they offered none (28%), less than 3 hours (31%), or 3–5 hours (12%) of PD. Teacher surveys also evidence a lack of participation in science PD (Figure 3): 68% of multi-subject teachers in self-contained classrooms report less than 6 hours of PD over the last 3 years; 36% report none at all.

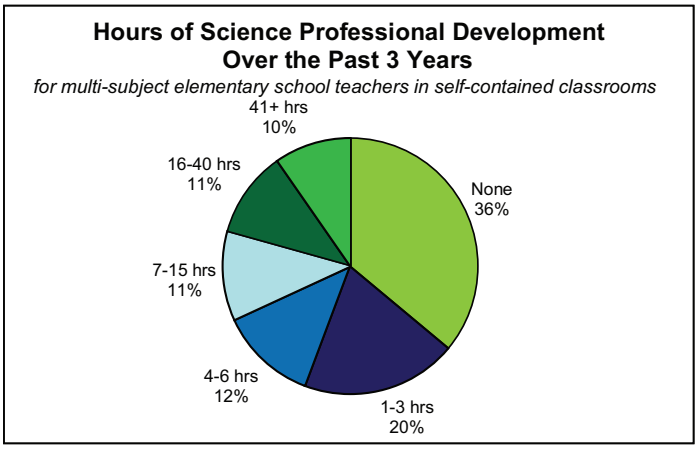


**Figure 3**

## Inconsistent and Inadequate Capacity

*There is inconsistent and inadequate capacity within Bay Area school systems to support science education in elementary schools.*

District and county offices lack capacity to provide professional development opportunities critical to the teaching force described above. There is a lack of both federal and state funding for elementary science education improvement efforts; thus, there is a current environment where there is minimal investment in and greatly diminished capacity for improving science education. Bay Area County Offices of Education offer limited support in some counties, and none in others. Just over half (52%) of school district respondents indicate they do not have capacity in their district office to support science education. The very small amount of district staff time assigned to support elementary science education is also evidence of inadequate system capacity.

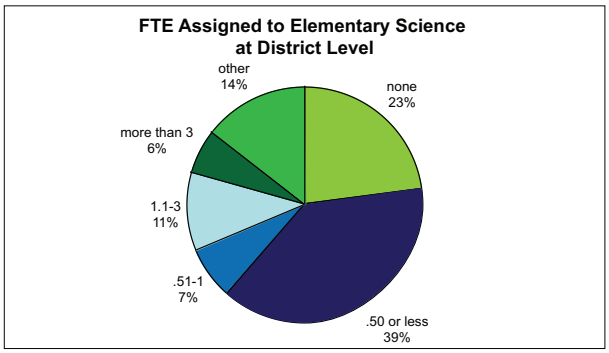


**Figure 4**

District respondents specify: 23% have no one assigned to support elementary science, 39% have less than .5 FTE, 38% have over .5 FTE or some other arrangement (Figure 4). At the same time, almost half (47%) of the district respondents indicate that they do not think their students are likely to encounter high quality science instruction in their district's elementary school classrooms. The few county or district offices that report high quality support point to the influence of a science "champion."

## Growing Potential for Improvement

*There is growing potential for improving elementary school science education in the Bay Area.*

The present landscape for science education in California also offers unique circumstances for science education. The new curriculum adoption and the addition of a 5th grade state science assessment present new supports and accountability pressures for schools in elementary science education. With 90% of school districts planning to select new materials by June 2008, many districts are taking a close look at their science education programs. Some schools and districts recognize the possibility of new materials and the new assessment requirements as opportunities for improvement and plan to employ one or more of the following improvement strategies:

- Increase classroom time spent on science
- Select new materials
- Integrate science with mathematics or reading/language arts
- Provide more science professional development opportunities
- Seek new funding sources to support science education
- Leverage passionate science teachers

Further, support for these improvement strategies may be found outside of the public education system. Research indicates that external organizations currently play a key role in supporting Bay Area elementary school science education. Many districts report receiving critical and high quality support and resources from external community sources (Figure 5). And both multi-subject and science specialists rate the quality of the PD they receive from these external sources higher than those within the public school system (Figure 6).

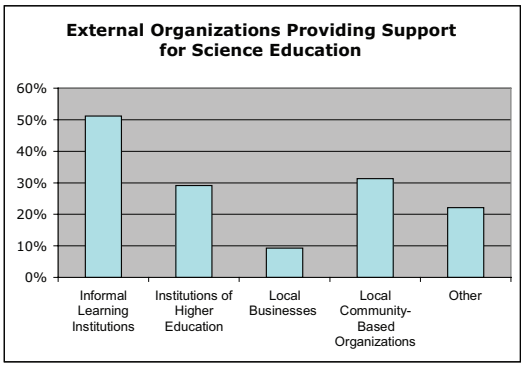


**Figure 5**

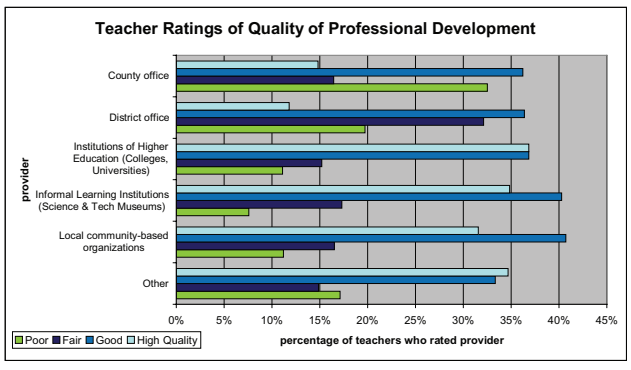


**Figure 6**

For further information see www.lawrencehallofscience.org/rea/bayareastudy

## The Challenge

*Improving science education in Bay Area schools will require support from policymakers, educators, and the larger community.*

Several factors impede districts, schools, and teachers in their efforts to support the improvement of elementary science education. Further, California schools, in general, and the Bay Area schools, in specific, serve many students who have exceptional educational needs, including a significant percentage of children who are in the process of learning English and/or live in poverty. Many Bay Area students are also from ethnic or racial groups who have traditionally been underrepresented in science fields. While some schools and districts recognize and plan to pursue opportunities for improving science education, others struggle with the pressures of *No Child Left Behind* that has rendered attention to science a low priority and the new materials and assessments inconsequential. As concluded in a recent national study,[11] *NCLB* has focused attention on literacy and math and increased the pressure at *Program Improvement (PI)* schools to perform in these two subject areas. This state of affairs has exacerbated the already low priority of science in the curriculum. Thus, in order to influence California students' science performance, policymakers, educators, and the larger community all have roles to play. Policymakers need to find ways to invest in broader capacity for improving science education; science-rich educational institutions (e.g. museums, science centers, universities, research labs, etc.) need to find ways to coordinate their efforts to support Bay Area schools and districts; and all need to find ways to work together to build on existing efforts, create new opportunities, and overcome current barriers.

**Notes on Study Methodology:**
Data collection focused on districts, teachers, and data in the nine Bay Area counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma). Data collection activities included:

- County Office of Education interviews (7 out of 9)
- Bay Area school district survey (almost 60% of Bay Area school districts responded, representing approximately 70% of the Bay Area elementary schools and students)
- Bay Area school district interviews (14)
- Bay Area teacher survey (923 exclusively elementary teacher respondents)
- Other Bay Area science support program interviews (4)
- Student demographic and achievement data (from CDE data sets)
- Science-rich education institutions (science centers, universities, etc.) surveys (17)

Based on these data, we anticipate the depiction presented herein represents a more favorable picture of the status of science education in the Bay Area than what actually exists. We expect that those district personnel and teachers who took the time to respond to the survey were more likely to be more engaged in science education than those who did not.

**Endnotes**


1. National Research Council (2005). *Rising above the gathering storm: Energizing and employing America for a brighter future*. National Academies Press; Washington, D.C.
2. Tai, R. H., Qui Liu, C., Maltese, A. V., Fan, X. (2006). Planning for careers in science. *Science Magazine*. Volume 312, May 26, 2006.
3. National Research Council (2006). *Taking science to school: Learning and teaching science in grades K-8*. The National Academies Press; Washington, DC.
4. Fulp, Sherri L. (2002). Status of elementary school science teaching. Horizon Research Inc.; North Carolina.
5. California Council on Science and Technology & The Center for the Future of Teaching and Learning. (2007). *Critical path analysis of California's science and mathematics teacher preparation system*. California Council on Science and Technology: California.
6. California percentage calculated based on individual level data, Bay Area percentage estimated from county-level data. California Department of Education (2007). http://star.cde.ca.gov/star2007/viewreport.asp
7. This study was conducted during spring 2007 by staff at the Center for Research, Evaluation, and Assessment at the Lawrence Hall of Science/University of California, Berkeley and at WestEd.
8. Same as #4.
9. McMurrer, J. (2007). *Choices, changes, and challenges: Curriculum and instruction in the NCLB era.* Center on Education Policy: Washington, D.C.
10. Same as #4.
11. Same as #9.



This study was commissioned by an emerging Consortium dedicated to the improvement of science education in the Bay Area. The study described herein, as well as the publication and dissemination of study findings, are funded by the Gordon and Betty Moore Foundation. Additional support has been provided by the S.D. Bechtel Foundation and the Stuart Foundation for further dissemination of the study findings.


GORDON AND BETTY MOORE FOUNDATION


**Citation Information:** Dorph, R., Goldstein, D., Lee, S., Lepori, K., Schneider, S., Venkatesan, S. (2007). *The status of science education in the Bay Area: Research brief*. Lawrence Hall of Science, University of California, Berkeley; California.