High Hopes – Few Opportunities

The Status of Elementary Science Education in California

Summary Report & Recommendations

THE CENTER FOR THE FUTURE OF Teaching & Learning at WestEd

Research conducted by:
The Lawrence Hall of Science at University of California, Berkeley and SRI International

High Hopes – Few Opportunities reports on extensive new research examining science education in the state's classrooms, schools and school districts. The research was conducted in support of Strengthening Science Education in California, a research, policy and communications initiative working to explore the status of science teaching and learning in the state and to offer recommendations for improving it. Partners in this initiative include the Center for the Future of Teaching and Learning at WestEd; the Lawrence Hall of Science at the University of California, Berkeley; SRI International; Belden Russonello & Stewart; Stone's Throw Communications and Inverness Research.

Belden Russonello & Stewart Research and Communications www.brspoll.com

Inverness Research www.inverness-research.org

The Lawrence Hall of Science University of California, Berkeley www.lawrencehallofscience.org

SRI International www.sri.com

Stone's Throw Strategic Communications www.stonesthro.com

The findings of this research, which are summarized in this publication, are based on the results of research surveys of California elementary and middle school teachers, principals, and school district leaders, analysis of secondary data on students and teachers, and case studies of science education efforts in California schools conducted in 2010 and 2011. This summary also includes results from previous public opinion research commissioned by the Center and conducted for the initiative entitled, *A Priority for California's Future: Science for Students*, which found that Californians believe that high-quality science education should be a top priority for the state's schools.

Funding for this initiative was generously provided by:

S.D. Bechtel, Jr. Foundation

Editorial and promotional services by Stone's Throw Communications of Manhattan Beach, CA.
Design by Capitola Design of Soquel, CA.

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Executive Summary

High Hopes – Few Opportunities is one in a series of reports designed to provide accurate, timely, and actionable information about the status of science education in California. The research documented in this report was conducted and published by the partners in Strengthening Science Education in California, a research, policy, and communications initiative* funded by the S. D. Bechtel, Jr. Foundation to examine the status of science learning and teaching and offer recommendations for improving science education in the state. Partners in the initiative are the Center for the Future of Teaching and Learning at WestEd, the Lawrence Hall of Science at the University of California, Berkeley, SRI International, Belden Russonello & Stewart, Stone's Throw Communications, and Inverness Research.

This report summarizes research findings on science education in California's elementary schools from multiple sources of data collected during 2010–11, specifically, surveys of district administrators, elementary school principals, and elementary school teachers; case studies of elementary schools; analysis of statewide secondary data sets; and public opinion survey research and focus groups.†

The research revealed that while educators and members of the public strongly believe that science education is important, it is not a priority in California's elementary schools because of the pressures of existing accountability systems, which are focused on English language arts and mathematics. Children rarely have the opportunity to engage in high-quality science because the conditions that would support such learning are rarely in place and because very little support infrastructure for science education exists in the state's schools and school districts. The research also showed, however, that a small number of elementary schools have found a way to provide a high-quality science program—an effort that requires commitment, expertise, partnerships, and resources.

California can fulfill the high hopes that many have for making science education a priority in our state and nation, but this will require real commitment to revise the accountability systems that have pushed science education out of California's classrooms. The state needs a new road map for supporting science education in public schools to ensure that all students have the chance to participate in high-quality science learning opportunities that are crucial to their success and to the future of our state.

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* This initiative was developed after questions were raised about the degree to which findings from the study *The Status of Science Education in the Bay Area* were representative of the situation across California. (Dorph, R., Goldstein, D., Lee, S., Lepori, K., Schneider, S., Venkatesan, S. [2007]. *The status of science education in the Bay Area: Research brief.* Berkeley, CA: Lawrence Hall of Science, University of California, Berkeley.)

† The survey samples were designed to be representative of California as a whole. For the district survey, we selected a stratified random sample of 451 districts (including high school) across the state, with a response rate of 62 percent for all districts (n=199 elementary districts). For the surveys of elementary school principals and teachers, we selected a fully random sample of 300 elementary schools, with one principal and up to five teachers selected from each school. We received responses from 56 percent of principals (n=166) and 70 percent of teachers (n=542).

High Hopes for Science Education

Across the nation, a consensus is emerging about the importance of science education and the related fields of mathematics, engineering, and technology. President Obama is advocating for more and better math and science education, saying, "Science is more essential for our prosperity, our security, our health, and our way of life than it has ever been."[1] The President's Council of Advisors on Science and Technology concluded, "The United States' response to the challenges of the 21st Century will be determined…by the effectiveness of science, technology, engineering, and mathematics (STEM) education."[2] The Business Roundtable proclaimed, "Math and science education must remain a priority."[3] In response, the National Research Council has developed a visionary new framework that emphasizes science education as a way to engage students in both the big ideas and the practice of science.[4] This framework will serve as the foundation for a new set of national science standards that California has been invited to participate in developing. The critical question is this: Is California ready to meet the challenge of providing more and better science education for all children?

California citizens and educators believe that science education is important and must start early.

In 2010, researchers involved in this initiative conducted and published *A Priority for California's Future: Science for Students*, a public opinion survey that found the public believes science education should be a high priority for California schools. Nearly 9 in 10 (86%) respondents view science education as very important or essential. Furthermore, 7 out of 10 say that learning science should begin in elementary school, and three-quarters of Californians are very convinced that science should be a higher priority for California schools because it keeps both the United States and California at the forefront of technology and innovation. They are persuaded that science helps young people to compete in the global marketplace and become engaged citizens, and 62 percent believe that making science a higher priority will attract industry to the state and provide a gateway to higher paying jobs.

WHAT CALIFORNIANS THINK

Nearly 9 in 10 Californians (86%) view science education as very important or essential.

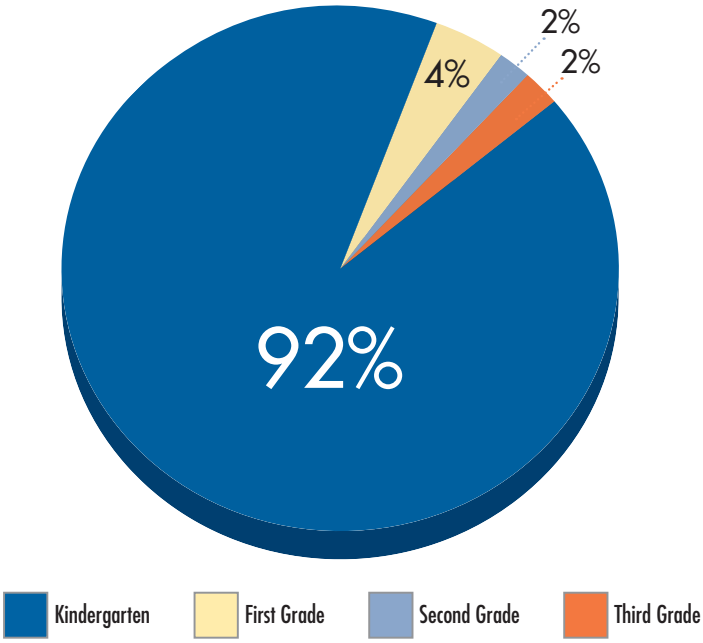
A Priority for California's Future: Science for Students, 2010

Educators overwhelmingly believe that science education is essential and should start early. Nine in 10 elementary schools principals believe that providing all students a strong background in science is essential or very important. In addition, almost all California elementary principals (92%) believe that science education should begin in kindergarten. All elementary principals believe that science education should begin no later than third grade *(Exhibit 1)*.

Teachers agree: 95 percent of elementary school teachers think that science should be offered beginning in the early grades (K–2).

Finally, teachers, students, and parents are united in their desire for more science learning opportunities. One teacher explained, "I would love to see science education increase. The children are hungry for exciting information about the world around them and science helps them get excited about becoming lifelong learners."

Exhibit 1: Elementary Principals Reporting the Grade at Which Schools Should Begin Teaching Science



Source: 2011 Statewide Science Education Survey of Elementary School Principals

What cognitive scientists say

All young children have the intellectual capability to learn science…young children have rich knowledge of the natural world, demonstrate causal reasoning, and are able to discriminate between reliable and unreliable sources of knowledge. In other words, children come to school with the cognitive capacity to engage in serious ways with the enterprise of science.[5]

But Few Opportunities

Despite public will and the opinion of educators and experts, science is not a priority in California public elementary schools.

The limited quality and quantity of science learning in California schools is clear evidence of the lack of priority placed on science education.

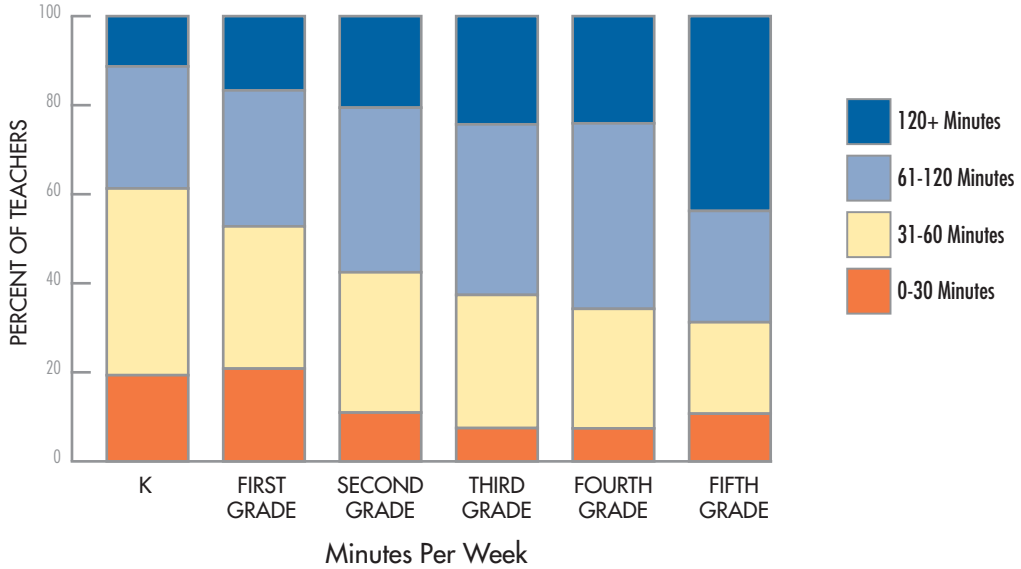
The quality of science learning is too low. Study findings revealed that California students do not typically experience high-quality science learning opportunities in elementary schools. Elementary school principals recognize this: Less than half (44%) believe it likely that a student would receive high-quality science instruction in his/her school. Analysis of elementary teacher survey data suggests that such learning opportunities are available on a regular basis in only about 10 percent of California elementary school classrooms.

High-quality science education offers students opportunities to:

- Learn about what scientists really do
- Learn and use the language of science
- Reason scientifically (e.g., engage in causal and mechanistic explanations of natural and physical phenomena, provide explanations based on evidence)
- Engage in the practices of science
- Build on prior knowledge, interest, and experience
- Learn core concepts related to big ideas in science (e.g., atomic-molecular theory of matter, evolutionary theory, cell theory) presented according to an understanding about the way children learn and build knowledge about these concepts.[6]

Little time is devoted to science learning. In kindergarten and first grade, more than half the teachers spend less than an hour per week on science *(Exhibit 2)*. As a student moves up the grades, the amount of time allocated to science increases, especially in fifth grade where science is tested. Yet even at fifth grade, most students have less than 120 minutes of science instruction per week. Forty percent of all elementary teachers spend 60 minutes or less on science instruction per week; indeed, 13 percent of elementary teachers spend 30 minutes or less.

Exhibit 2: Time Spent on Science Instruction in Elementary School



Source: 2011 Statewide Science Education Survey of Elementary School Teachers

WHAT CALIFORNIANS THINK

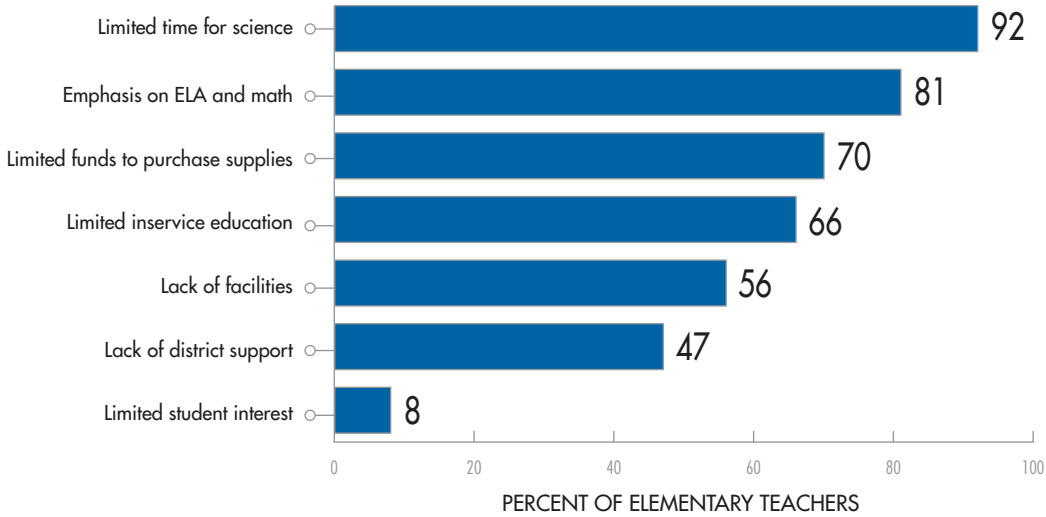
Latino parents (63%) are more likely than other groups to say that their children do not spend enough time learning science in school.

A Priority for California's Future: Science for Students, 2010

Accountability pressures limit time for science. The lack of attention paid to science education, in part, reflects accountability mandates. Schools are under tremendous pressure to meet both federal and state achievement targets—and those targets are weighted heavily toward English language arts and mathematics in elementary schools. It is important to note that the pressure to focus on English and mathematics poses a challenge to teaching science in *all* schools, not just those schools under increased scrutiny for chronically low test scores.

Elementary teachers consistently point to "time" and "the focus on English language arts and mathematics" as the greatest challenges *(Exhibit 3)*. As one teacher explained, "I love teaching science, and my students enjoy learning it. There's just so much else we have to cover—English language arts, mathematics…It's hard to get science in."

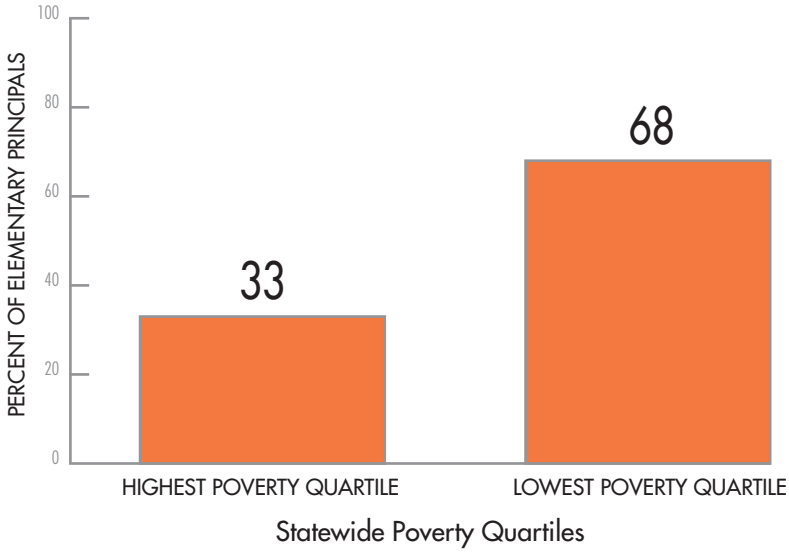
Exhibit 3: Teacher-Reported Factors That Are Major or Moderate Challenges to Teaching Science



Source: 2011 Statewide Science Education Survey of Elementary School Teachers

Science may be even less of a priority in some schools. Providing high-quality science learning opportunities is a challenge in most elementary schools, but schools serving low-income students face more intense challenges. Principals in more affluent schools were more than twice as likely (68%) to report having launched science initiatives over the past 5 years than were those in the state's poorest schools (33%) *(Exhibit 4)*.

Exhibit 4: Elementary Principals Reporting Significant Science Initiatives in the Past 5 Years, by School-Level Percentage of Free and Reduced-Price Lunch



Source: 2011 Statewide Science Education Survey of Elementary School Principals

WHAT CALIFORNIANS THINK

African Americans (89%) and Latinos (75%) are most likely to say students should have more science education than they had when they were in school.

A Priority for California's Future: Science for Students, 2010

Inadequate science learning opportunities in California elementary schools may help explain troubling test results. On the most recent fourth-grade National Assessment of Educational Progress (NAEP) science assessment, California students performed at the lowest level nationally, along with students in Arizona, Mississippi, and Hawaii.[7] Fewer than 10 percent of the state's African American and Hispanic fourth-graders scored at or above proficient on NAEP's science assessment, compared with 41 percent and 45 percent of their White and Asian peers, respectively. Although scores on the California Standards Test (CST) in science have risen over the past few years, gaps among ethnic groups persist on the state exam as well. Seventy-seven percent of White students performed at proficient or above on the fifth-grade science CST in 2011, as compared with 45 percent of Hispanic and 43 percent of African American students.[8]

WHAT CALIFORNIANS THINK

Almost two-thirds of Californians (64%) say science education should be a priority in order to give children an opportunity to succeed in life.

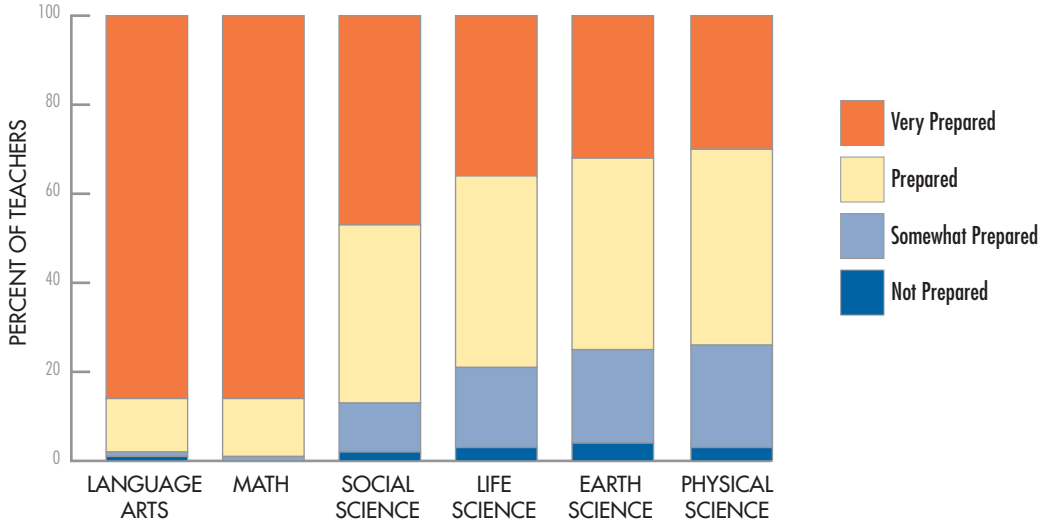
A Priority for California's Future: Science for Students, 2010

The conditions that support high-quality science learning opportunities are rarely in place.

The limited quality and quantity of science learning opportunities has created conditions in which teachers are unprepared, materials and facilities are in short supply, and local assessment systems are lacking.

Elementary school teachers are less prepared to teach science than other subjects.
Only about a third of teachers feel very prepared to teach the subject *(Exhibit 5)*.

Exhibit 5: Elementary School Teachers' Self-Reported Preparedness to Teach Various Subjects



Source: 2011 Statewide Science Education Survey of Elementary School Teachers

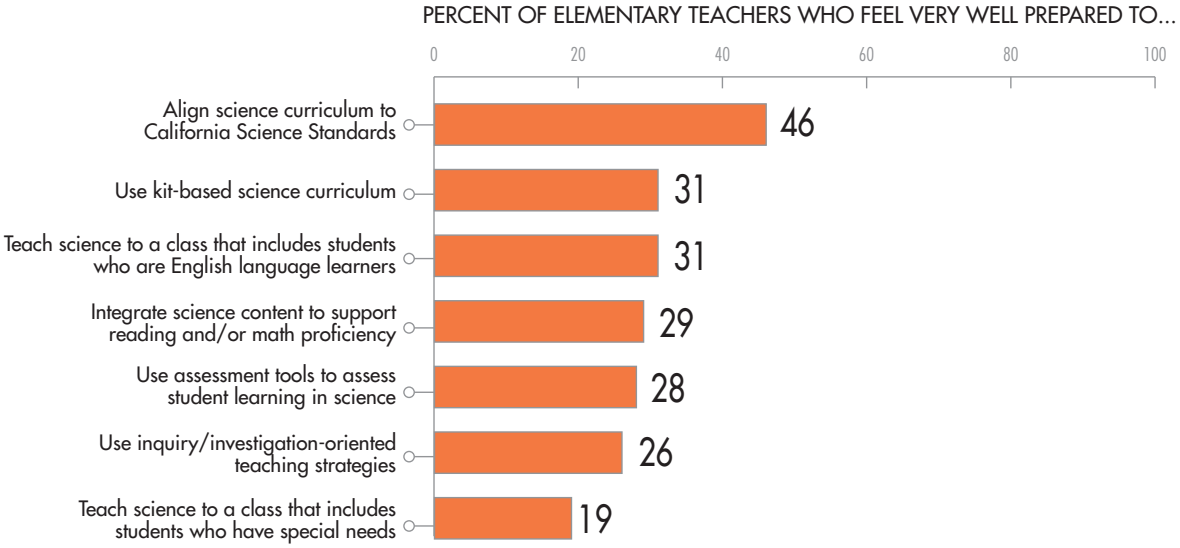
WHAT CALIFORNIANS THINK

More than half (56%) of Californians say elementary teachers should have extra preparation and special training to teach science.

A Priority for California's Future: Science for Students, 2010

The research also found that many teachers do not feel prepared to undertake some of the activities most central to high-quality instruction, such as the use of inquiry and investigation *(Exhibit 6)*. Also of concern is the fact that so few California teachers feel very well prepared to teach science to a class that includes students who are English language learners (31%) and students who have special needs (19%).

Exhibit 6: Elementary School Teachers' Self-Reported Preparedness in Specific Science Instruction Activities



Source: 2011 Statewide Science Education Survey of Elementary School Teachers

Key Terms

By ***inquiry/investigation oriented***, we mean that the instructional materials are designed to lead students to construct an understanding of science concepts through investigations and analyses, using laboratory equipment, readings, and interactive technology.

High-quality science learning opportunities that enable students to engage in the practices of science require the materials and tools of science. To make these materials and tools more easily accessible, many publishers package them into a kit that is available for purchase. These types of materials are commonly known as ***kit-based***.

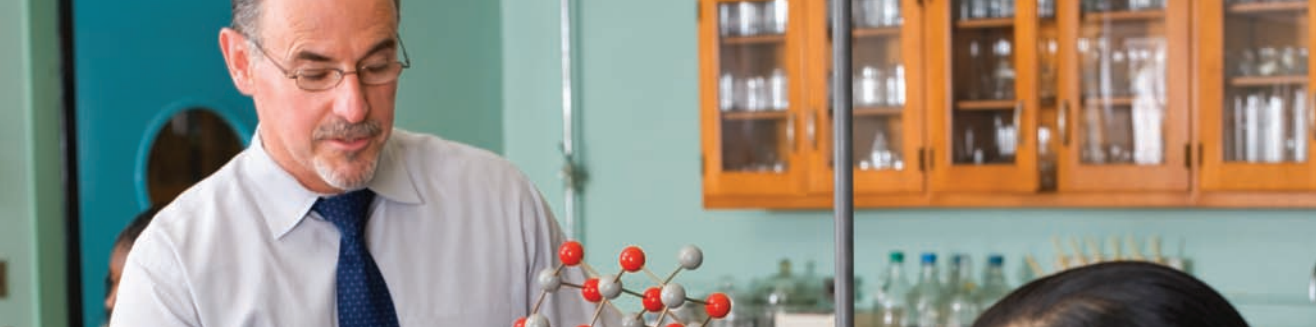
The facilities and resources needed for science education are often in short supply. Many elementary classrooms suffer from limited space, facilities, and supplies for engaging in the practices of science. Seventy percent of elementary teachers report inadequate space for hands-on learning. Two-thirds (66%) of elementary teachers identify limited funds for equipment and supplies as a major or moderate challenge to providing science instruction, and 56 percent identify lack of facilities as a major or moderate challenge. Compared with more affluent schools, those serving poor students are less likely to have access to facilities such as science labs or dedicated classrooms. More than a third (35%) of elementary teachers in the schools serving the highest percentages of students in poverty identify facilities as a *major* challenge to teaching science, compared with 13 percent of teachers in the most affluent schools.

The quality of science learning in elementary schools is also limited by the absence of sound and reliable assessment data. The California statewide science assessment for fifth grade does not provide teachers with the information they need to support student learning; nor does it capture all the important learning outcomes related to science. Local assessments have the potential to help monitor student progress and identify gaps in understanding. Policymakers must balance the need to obtain system-level data on student progress with the need to provide teachers with sufficiently tailored data helpful in guiding instruction.

WHAT CALIFORNIANS THINK

Seventy-one percent of Californians believe that more resources and better equipment would make a big difference in improving science education.

A Priority for California's Future: Science for Students, 2010



There is very little supportive infrastructure for science education.

Meaningful support for science education is scarce. Over 60 percent of districts have *no* district staff dedicated to elementary science, with another 13 percent reporting that they have less than 0.5 full-time equivalent district staff dedicated to elementary science. Three-quarters of elementary schools do not have access to a science specialist or coach.

Limited district infrastructure for elementary science translates into little to no capacity to offer professional development. Fewer than 21 percent of districts provide science-related professional development for elementary teachers. Over 85 percent of elementary teachers have not received any science-related professional development in the last 3 years. Given this lack of professional development, it is not surprising that 62 percent of elementary teachers identified the lack of professional development as a major or moderate challenge to providing science instruction in elementary school. Principals and district administrators need support to provide the professional development necessary to sustain high-quality science instruction in their elementary schools.

Over 85% of elementary teachers have not received any science-related professional development in the last 3 years.

Effective science teaching requires other types of infrastructure as well. If districts expect teachers to use hands-on instructional materials, it is critical that they take steps to ensure that the materials are both available and used. High-quality science learning opportunities that enable students to engage in the practices of science require the materials and tools of science (e.g., specimens to grow, chemicals to mix, and equipment such as microscopes and petri dishes). To make these materials and tools more easily accessible, many publishers package them into a science kit that is available for purchase. Although these kits must be maintained and restocked, this process is far less burdensome than gathering or purchasing all the materials separately or leaving it to teachers to buy them themselves.

Statewide, programs and resources have also been hit hard. In 2001, the California Science Project (CSP), offering professional development for teachers and teacher leaders across the state, was funded at $4 million. In 2002–03, CSP funding increased to a total of $9.09 million. Today, CSP has minimal funding—only $1.2 million in 2011, comprising both state and federal funds. Furthermore, the instructional-materials adoption process that, in the past, has occurred every 7 years and offered opportunities to refresh the curricular options available to teachers has been suspended.

> *We do not get professional development in science. We are told it doesn't matter in our AYP.*
>
> – Elementary school teacher

WHAT CALIFORNIANS THINK

Seventy-seven percent of Californians say that more training for teachers would make a big difference in improving science education.

A Priority for California's Future: Science for Students, 2010

It can be done—but making science a priority requires commitment, expertise, partnerships, and resources.

High-quality science activities—those supporting students to engage in investigation, experimentation, and scientific reasoning—take many forms. Visits to schools across California revealed that there are many paths to providing students with such opportunities: time for teaching, well-prepared teachers, well-stocked classrooms, dedicated leadership, and other resources. In some instances, teachers have led the effort to create the conditions for high-quality science learning. In other cases, district and school leaders have communicated a vision and backed it up with practices to maintain materials and provide appropriate professional development for teachers and principals. In many cases, these strategies have relied on external partnerships and funding that have brought additional expertise and resources into classrooms, schools, and districts. The following offers a window into some of the strategies these schools have used to prioritize and enable high-quality science learning.

Finding time for science through integrating science across the curriculum. Students cannot learn without sufficient time—and teachers consistently say that they do not have enough time for science. Some schools overcome this challenge by integrating science with other content areas, typically English language arts. Teachers who frequently integrated science with other subjects offered science an average of 130 minutes a week, compared with an average of 94 minutes per week for teachers who rarely or never integrated science. In addition to helping to provide time for science, integration across the curriculum helps students realize that science permeates everything—they begin to see science in their everyday lives. Moreover, integrating science creates opportunities for students to develop nonfiction reading and expository writing skills. To successfully integrate science with other content areas, however, requires significant support for schools and teachers (e.g., professional development, appropriate instructional materials).

> *"I think it's important that kids know science isn't just during science lab; we're scientists all the time. Predicting, questioning, all those skills are done almost every second of the day."*
>
> – Elementary school teacher

Building on teachers' specialized competence. One strategy schools use to address the challenge of many elementary teachers' lack of preparation for teaching science is to take advantage of the specialized competence of certain teachers. Two case study schools rely on science resource teachers—in one case to teach science to all children in the school and in the other to act as a resource for teachers. However, schools find it increasingly difficult or impossible to support specialized positions. At one of these schools, the principal relies on 13 different budget line items to cover the half-time science teacher's salary. At other schools, teachers have taken it upon themselves to create instructional "specialties," including science. In one such school, students rotate among teachers twice a week for an hour each time so that teachers can teach their specialty subject to each other's students. They find this process helps keep them on track with the district's pacing guide and ensures that all students receive science, social studies, and art from a teacher who is prepared to teach it. One advantage of such strategies is that they allow both individual teachers and schools to focus their professional development resources, which helps build confidence, competence, and enthusiasm. As one teacher explained, "I feel very confident with what I'm doing now, since I teach all science to all the fourth-grade students."

> *"I feel that my lack of science content knowledge is my biggest challenge."*
> – Elementary school teacher

Building the competence of teachers across the school. Whether integrating instruction, team teaching, or taking another approach to science teaching, teachers need ongoing professional development. Teachers in case study schools participated in both school- and district-sponsored training (often supported by grant funds and delivered by partnering organizations), as well as in professional development they sought out on their own. One case study school provided all teachers with professional development by teaming with a California Science Project site, science center trainers, and an expert in science literacy. Trainings included summer institutes and Saturday events to build teachers' content and pedagogical content knowledge covering a broad range of subjects such as earth, life, and physical sciences; materials management; and science literacy. These trainings allowed time for the teachers to put their new knowledge into practice by planning lessons together in grade-level teams. In many cases, professional development opportunities were provided through, or in partnership with, science-rich education institutions (e.g., California Science Project sites, NASA's Jet Propulsion Lab, Monterey Bay Aquarium, National Science Teacher Association conferences).

Creating the needed infrastructure to provide teachers with instructional materials. If teachers cannot rely on getting necessary materials in time, or if they must purchase materials on their own, they are much less likely to use them. Some of the districts with case study schools had created centralized locations, sometimes called science material resource centers or science centers, where materials were refurbished and then delivered to schools. To reduce the cost of the initial purchase of instructional materials, some districts, rather than purchase full sets of instructional materials for all classrooms, had created a rotation system whereby they purchase a set of 8- to 10-week hands-on instructional materials for classrooms to share, of which one third are for earth science, one third are for life science, and one third are for physical science. Although this rotation enables the districts to buy and store fewer consumables, thus reducing costs, it also requires their commitment of infrastructure and personnel to manage the collection, the restocking of supplies, and distribution of materials.

Providing district support to school leaders to strengthen science teaching. District administrators and principals must focus attention and support on science in order to sustain high-quality science instruction in elementary schools. Two districts in our case study sites have developed formal strategies for building a common vision of high-quality elementary science instruction, as well as working with principals to support such instruction. In one district, the science coordinator provides principals with instructional-materials training so that they become familiar with the expectations for instruction. This coordinator also meets with principals annually to support them to ensure that teachers get what they need to implement the science curriculum. In another district, the science coordinator often conducts walk-throughs with principals to observe science instruction. He then debriefs with the principal; they discuss what high-quality science instruction should look like and the evidence they saw of it during the walk-throughs. These practices keep elementary science at the forefront of district and school efforts, support leaders, and communicate to teachers that science is important and should be taught during the regular school day.

Leveraging resources and partnerships to support high-quality science instruction. High-quality science requires materials and access to expertise. In this fiscal climate, schools lack funds to purchase materials and support learning—with those subject areas not central to state and federal accountability at greatest risk of significant budget cuts. Our case studies suggest that some districts and schools rely on grants or donations to support the initial start-up costs of elementary science initiatives as well as their ongoing maintenance. Unfortunately, too few schools and districts have access to such funding sources. Overall, 70 percent of districts and 72 percent of schools *do not* receive funds from external sources to support elementary science. When available, such resources came through partnerships with informal science institutions. These partnerships took many forms (e.g., professional development, direct services, planning) and were generally praised by teachers, principals, and district administrators as reinforcing science concepts or introducing new science concepts in an experiential or hands-on way.

Case Study Example

Recognizing the importance of partnerships, one of the districts in our case study pool created a science partners network 3 years ago to actively nurture such relationships. The network has grown from 15 to 45 organizations (including institutions of higher education, county offices of education, foundations, nonprofit organizations focused on science and the environment, museums, corporations, regional parks, public television and radio stations, and national laboratories). The network allows the district to engage the community on a regular basis by sharing current district efforts in science education and asking partners to help the district problem solve specific challenges. For example, the district did not have access to a facility big enough to conduct science trainings for teachers, and two partners offered their facilities free of charge.

Recommendations

Place a higher priority on science now and for the future.

California citizens, parents, and educators recognize the importance of education that prepares all students for college and careers. They believe that quality science education will keep California at the forefront of technology and innovation, attract industry to the state, and provide a gateway to higher paying jobs. However, the California education system is far from meeting these practical and necessary ideals. The goal of a "full and balanced curriculum" is unrealized. Students do not have the opportunities they need to participate in high-quality science learning experiences because the conditions for doing so rarely exist.

California is not ready to respond to the call for more and better science education. Bold efforts are needed to strengthen knowledge, skills, and material supports. California's education and policy leaders must take immediate action to **restore a full and balanced curriculum** in the state's public schools. In doing so, California must address policies that currently limit time for and attention to science education.

For state policymakers:

Immediately review and revise the accountability systems that are driving science education out of California's public schools. The gap between what the public, educators, and science experts believe to be critical in California classrooms and the systems of incentives and sanctions that the state provides must be closed.

- Place greater emphasis on students' academic achievement in science, including support for infusing the system with sound practice in assessment and accountability that serve to guide instruction and strengthen teaching practice.
- Ensure that accountability-driven interventions in schools and districts emphasize a comprehensive and balanced curriculum that includes science.

Restore a full and balanced curriculum for every student, starting by including science in the elementary grades.

- Establish a cohesive teacher development system in science that is anchored by teacher preparation and induction, and provide high-quality professional development to support the science-teaching practice of all veteran teachers.
- Beginning with kindergarten and including grades 1 through 6, put science instruction back into the curriculum alongside English language arts and

mathematics. This will require examining existing guidelines for instructional minutes for English language arts and mathematics to ensure that science instruction is not crowded out for lack of time.

- Provide strong models of alternative staffing arrangements and supports that bring science expertise closer to the classroom.

Establish adequate resource allocation and support systems to ensure that students have the opportunity to participate in high-quality science learning experiences.

- Rebuild infrastructure that supports science education improvement. This infrastructure should include support at the school, district, and county levels, as well as explicit and strategic use of existing and potential capacity and infrastructure of science-rich institutions (such as institutions of higher education, science centers, museums, zoos, aquaria, and national laboratories).
- Ensure that students have tools they need to fully engage in science learning, including the infrastructure and personnel required to manage the collection, refurbishment, and distribution of materials.
- Begin now to prepare for implementation of the Common Core Standards in science by strengthening the conditions that are needed to support science education (e.g., teacher workforce, materials/equipment and facilities, assessment, leadership). Further preparation for the implementation of the Common Core Standards can benefit from and be guided by the vision of high-quality science education embodied in *A Framework for K-12 Science Education*.[9]

WHAT CALIFORNIANS THINK

Californians strongly believe that science should be a higher priority for all California schools.

A Priority for California's Future: Science for Students, 2010

For local policymakers:

Examine the status of elementary science instruction in the district, attending to both quality and quantity.

- Increase the time students spend in the study of science. For example, support the integration of science throughout the curriculum by providing adequate staff development and time for teachers and principals who plan and implement this approach.
- Increase support for teachers to teach science by providing appropriate materials and space, professional learning opportunities in science pedagogy and content, and access to science learning expertise.
- Examine flexible and varied uses of time and space to support deep and relevant engagement in the practices of science.
- Build on successful models of public entities partnering with science-rich education organizations to strengthen science learning opportunities for students and teachers.

If California is to provide more and better learning opportunities for all children in its public schools, strengthening science education must be a priority. The state needs a new road map for supporting science learning in public schools that aligns this priority with the state's systems of accountability, assessment, resource allocation, and teacher development. Only then will it be possible to implement a unified vision for science education, ensuring that every student receives high-quality science instruction from a well-prepared and knowledgeable teacher and has access to the materials and resources that enable him or her to fully engage in learning science.

We understand that the reforms called for will take time, but California children need quality science learning opportunities now. Today is not too early to start.

Endnotes

[1] Obama, B. (2009, April 27). Remarks to the National Academy of Sciences, Washington, D.C. Retrieved from http://www.whitehouse.gov/the-press-office/remarks-president-national-academy-sciences-annual-meeting.
[2] President's Council of Advisors on Science and Technology. (2010, September). *Prepare and inspire: K-12 education in science,technology, engineering, and math (STEM) for America's future.* Retrieved from http://www.whitehouse.gov/sites/default/files/micreosites/sotp/pcast-stemed-report.pdf/p.V.
[3] Business Roundtable. (2011, March 9). *Business leaders say scientific research and math and science education must remain top priority.* Retrieved from http://businessroundtable.org/news-center/business-leaders-say-scientific-research-and-math-science-education-must-re/.
[4] National Research Council: Committee on a Conceptual Framework for New K-12 Science Education Standards: Board on Science Education. Division of Behavioral and Social Sciences and Education. (2007, in press for 2011). *A framework of K-12 science education: Practices, crosscutting concepts and core ideas.* Washington, DC: The National Academies Press.
[5] Ibid.
[6] Ibid.
[7] U.S. Department of Education. (2009). NAEP State Profiles. Retrieved from http://nces.ed.gov/nationsreportcard/states/.
[8] California Department of Education. (2011). STAR test results. Retrieved from http://dq.cde.ca.gov/dataquest/.
[9] National Research Council et al., op. cit. (in press for 2011).

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