



BaySci - Lawrence Hall of Science: Evidence and Reflections from Ten Years of Study

by Inverness Research

This evaluation brief summarizes the work of Inverness Research over the past decade to support and document the work of the BaySci initiative housed at the Lawrence Hall of Science. The brief shows how an intermediary organization such as BaySci can support districts in improving their science programs by implementing high-quality science standards and by working toward the coherence of science standards and other disciplinary standards. The findings presented here draw upon years of observation, participation in key events, classroom visits, surveys, and interviews.

What is BaySci?

Focused on district capacity-building, BaySci is committed to improving science education through the development of a districtwide vision for science, distributed leadership, and an explicit attention to equitable science teaching and learning. BaySci offers districts access to a wide range of resources, national expertise, customized assistance, and ongoing feedback.

BaySci follows a network strategy, bringing together California educational institutions, districts, and teachers to help them pursue strategic and systemic improvement of their K-12 science education programs. Within this community, K-12 science becomes a shared and important priority among districts, leaders, and teachers who are eager to learn from and share with each other, generating a level of commitment not typically seen in school districts. Districts purchase a membership in the BaySci network and typically participate for three or more years.

Over the course of the program, BaySci has employed the following programmatic strategies to achieve success in building the capacity of district partners for science education:

1. Creation of Vertical Leadership Teams

Comprised of superintendents, assistant superintendents, curriculum coordinators, principals, resource teachers, specialists, and classroom teachers, these teams assume responsibility for the design and implementation of a long-term systemic effort to increase opportunities for science learning within the district.

2. Leadership Seminars

BaySci convenes all the district leadership teams for day-long seminars in which there is professional learning in science improvement, sharing across districts, and work time for district leadership teams to plan.

From BaySci: The overarching objective of BaySci is to support the development of system (school and district) capacities that result in a strong instructional program for science. The ways in which an LEA and/or school district is developing the capacities, communication, policies, and culture that are necessary to build and sustain a high-quality, standards-based K-6, K-8, or K-12 science education program, we call the “signal” of science. However, there are also contextual conditions that most influence the probability that a science improvement effort will succeed: the “noise” within and surrounding the district. We believe that in order for the signal of science to be strong enough, relative to the noise, the district must develop multiple capacities for supporting a high-quality science program.

3. Technical Assistance & Implementation Support

BaySci staff advise individual districts, meeting with them to review progress and offer advice on design and implementation as well as offering concrete professional learning support to the district.

Who is Inverness Research?

Inverness Research is an external research and evaluation group with many years of experience studying science improvement efforts, networks, and district change initiatives. We have worked with BaySci in both a formative and summative role for the past 10 years. During that time, we have studied the participation and progress of many BaySci districts and gathered evidence about the contributions of the BaySci initiative to those districts. Just as BaySci seeks to advance districts' efforts to improve their science programs, Inverness Research seeks to improve (and document) the design, implementation, and success of BaySci.

Science Education Research

There is ample evidence that science education in California and the United States needs improvement.¹ Simply put, there are three basic issues to be addressed: 1) not enough time is spent teaching science in the elementary grades, 2) when science is taught, it is not always taught well, and 3) there is a fundamental equity issue in the huge variation and lack of consistency in science teaching within and across districts, schools, and classrooms. Over the years, many strategies have been used to improve science learning: curriculum development, professional development, new standards, innovative assessments, and policy changes. All of these are necessary but not sufficient; what is ultimately needed is to develop the indigenous systemic capacity for districts to engage in ongoing improvement of their own science instruction.

¹ Dorph, R., Shields, P., Tiffany-Morales, J., Hartry, A., McCaffrey, T. (2011). High hopes—few opportunities: The status of elementary science education in California. Sacramento, CA: The Center for the Future of Teaching and Learning at WestEd. Retrieved from <https://www.wested.org/resources/high-hopes-mdash-few-opportunities-full-report-the-status-of-elementary-science-education-in-california/>. And Hartry, A., Dorph, R., Shields, P., Tiffany-Morales, J., & Romero, V. (2012). The status of middle school science education in California. Sacramento, CA: The Center for the Future of Teaching and Learning at WestEd. Retrieved from <https://www.wested.org/resources/untapped-potential-the-status-of-middle-school-science-education-in-california/>.

SYNOPSIS OF INVERNESS FINDINGS

- **BaySci provides an effective route to improvement:** *Over the years, districts participating in BaySci report that the initiative supports them in designing, planning, implementing, and refining their districtwide science improvement efforts. They value the work done by BaySci and find the time and money they invest in the initiative to be worthwhile and cost-effective.*
- **More and better science is being taught:** *Our studies of classrooms show that more science is being taught in BaySci districts compared to other districts (elementary level) and that the quality of lessons improves over time and is better than the national average.*
- **Keeping science on the radar screen:** *BaySci helps districts elevate science as a priority and helps them sustain momentum during times of change or turbulence.*
- **Developing system capacity:** *BaySci helps districts develop internal system capacity (leadership, vision, knowledge, policies), which is critical for designing, implementing, and maintaining improvements in their science programs.*

KEY EVALUATION FINDINGS

1. BaySci Helps Districts Improve Their Science Education Improvement Efforts

BaySci uses its expertise and resources as a science-rich intermediate organization to support networks of districts to improve their science programs. The BaySci initiative works to engage districts in a well-designed, long-term process of design, planning, and implementation. In this sense, BaySci is an effort that is aimed at improving improvement—that is, it works with districts in a way that strengthens their long-term capacity to improve their own science programs.

Of the many science projects I have participated in, BaySci has been the best program at really putting change in the district.
District Leader

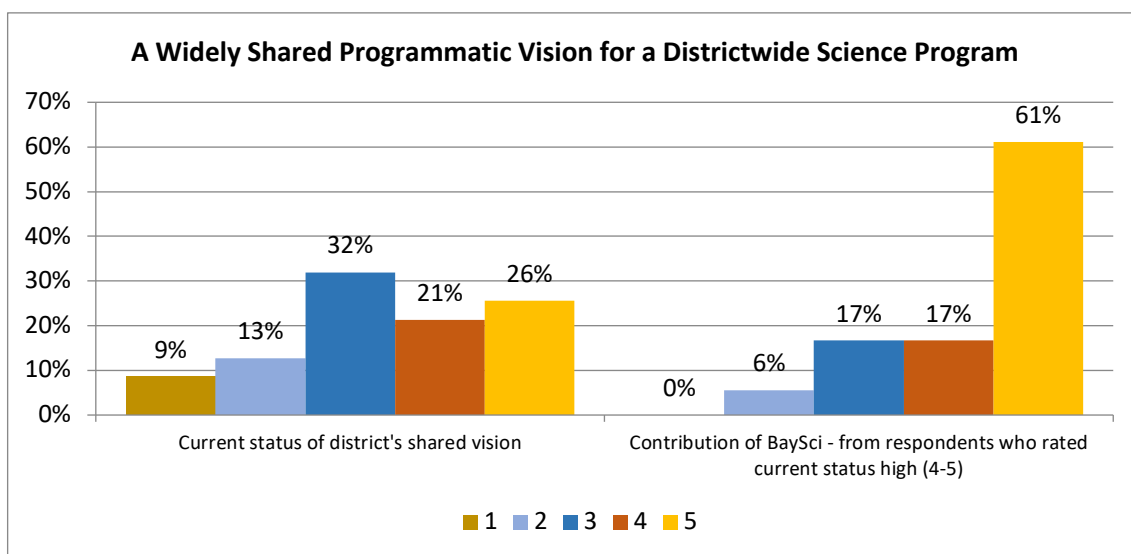
Data collected by Inverness Research show that districts find BaySci to be a high-quality and highly valued resource, which does, in fact, help districts build the capacities needed to improve science teaching and learning districtwide.

- **Development of a Shared Vision of a Districtwide Science Program**

BaySci places a priority on helping districts create a **shared vision** for their districtwide science programs. While many districts may have isolated pockets of strong science teaching, few have a vision for an equitable, high-quality science program across the district. BaySci helps districts with a critical first step: creating a clearly articulated, shared vision for equitable science teaching and learning—what should be taught, how it should be taught, who has access, and what resources will be available to support that articulated program.

The graph below shows how BaySci districts responded to the question of whether or not they currently do, in fact, have a shared, clear, districtwide vision for their science programs. It also shows that BaySci has been very helpful to them in creating that vision.

Seventy-nine percent of respondents report that the degree to which their district has been able to develop, articulate, and build consensus around an explicit and concrete vision of their desired science program is medium to high, a rating of 3, 4 or 5. All report that BaySci has contributed to their current shared vision, and 78% who rated their current status 4 or 5 said BaySci’s contribution to that vision is large to significant (4 or 5).



(Percentages shown are based on a scale of 1-5. For “Current status,” 1 = low, 3 = medium, 5 = high. For “Contribution of BaySci to current status,” 1 = no contribution, 3 = some contribution, 5 = significant contribution.)

- **A Vision and Concrete Plan for Implementation**

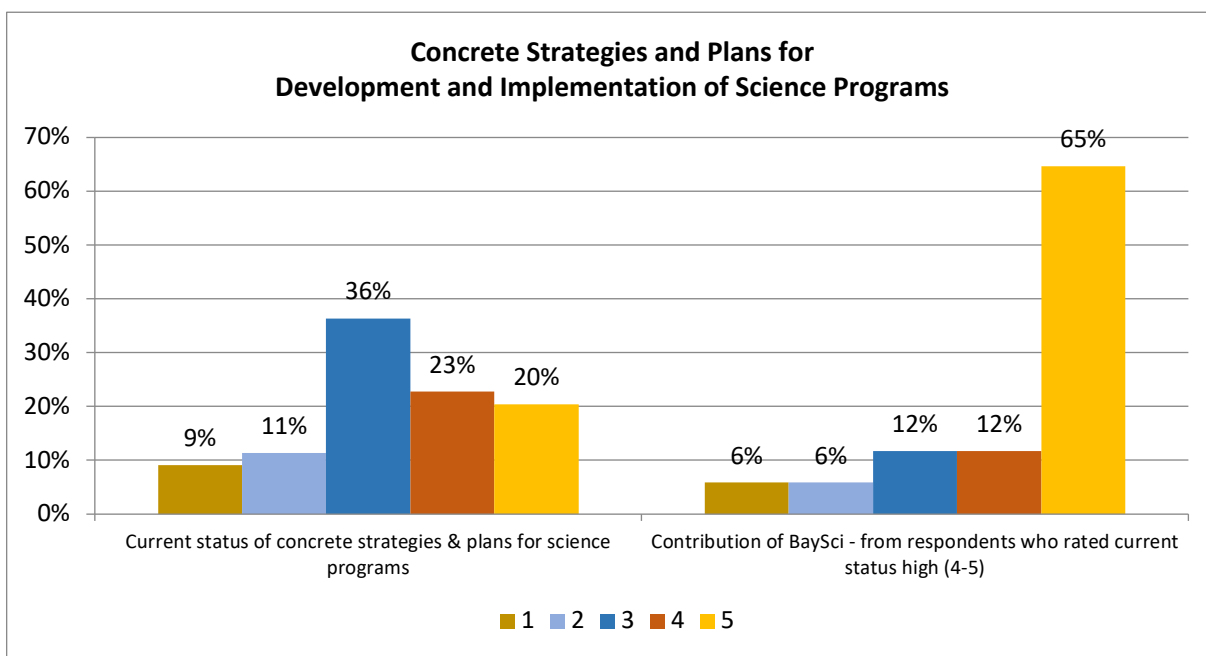
It is not enough to simply envision a science program. Districts must also be able to create a realistic and strategic plan for realizing that vision.

In the graph below, BaySci districts report that they have designed concrete strategies and plans for developing and implementing their science programs and that BaySci has been an important, strong contributor to their planning process.

Seventy-nine percent report that the degree to which their district has been able to develop agreement about and support for the specific steps involved in implementing their science program on a districtwide basis is medium to high (a 3, 4 or 5 rating). Almost all respondents said that BaySci has contributed to their current status, and 77% of those who rated their current status 4 or 5 said BaySci has made a large or significant (4 or 5) contribution to their current status.

BaySci gives voice to science...It has provided our district with a vision of and mission for science – this helps us to have discussions about the coordination of professional development, distribution and management of science materials, and a shared understanding of best practices for NGSS. In these ways it is making a difference.

District Leader



(Percentages shown are based on a scale of 1 - 5. For "Current status," 1 = low, 3 = medium, 5 = high. For "Contribution of BaySci to current status," 1 = no contribution, 3 = some contribution, 5 = significant contribution.)

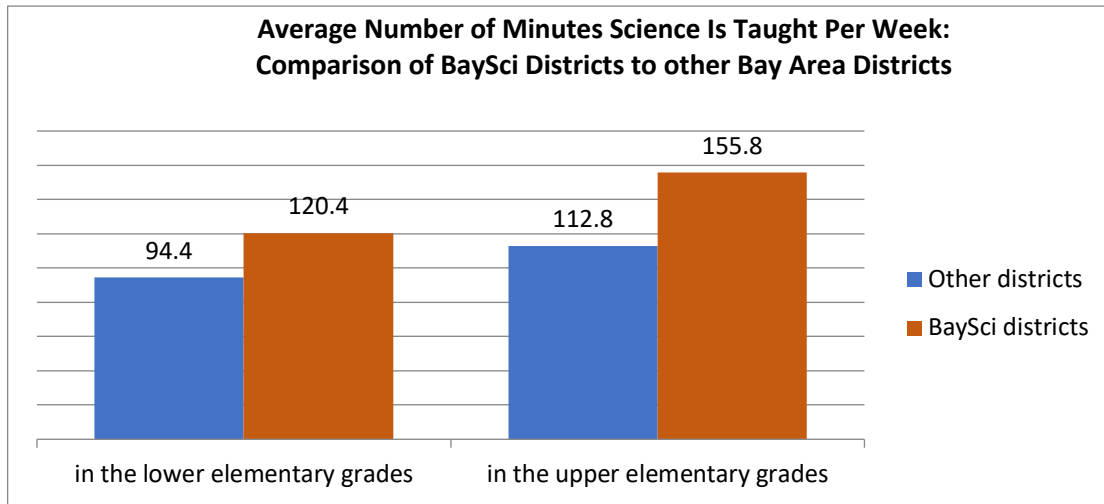
2. BaySci Helps Districts Increase the Quantity and Quality of Science

Almost all respondents reported at least some degree of improvement in the quality and quantity of science teaching across their district, with 35% saying that it is "significantly improving."

- **Increasing the Amount of Science Taught at the Elementary Level**

Within a district, the amount of elementary science teaching can differ greatly from one school to the next, and within schools from one classroom to another. In many classrooms in California, elementary science is taught less than one hour per week.

Districts participating in BaySci demonstrate higher than average amounts of science teaching in elementary school compared with other districts. The graph below shows the average number of minutes that science is taught in the elementary grades per week.

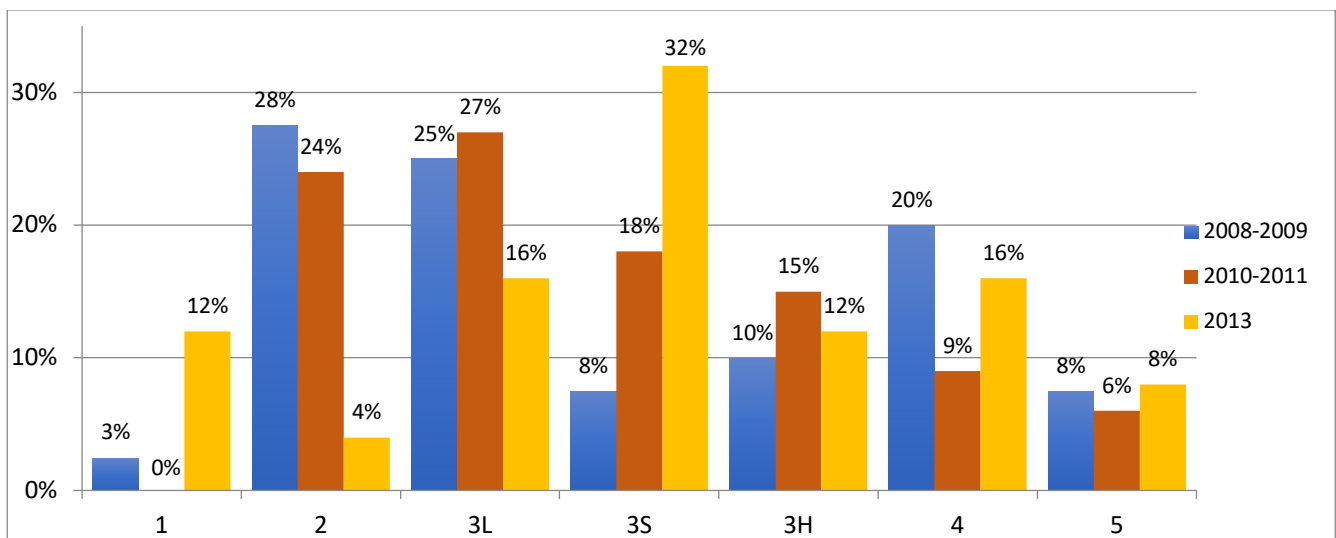


- Increasing the Quality of Science Lessons

Over the years, Inverness researchers observed the quality of science teaching in nearly 100 BaySci classrooms. Researchers rated lessons across several dimensions (lesson design, implementation, content, classroom culture), and then synthesized those ratings into an overall “capsule” rating. Capsule ratings range from 1 (ineffective instruction) through 5 (exemplary instruction), with three options at level 3 (3-low, 3-solid, and 3-high).

The graph below illustrates the increase in quality of science teaching in participating BaySci districts over time. The percentage of quality science lessons—those rated a 3-solid, 3-high, 4, or 5—increased from 46% to 68% over a four-year period.

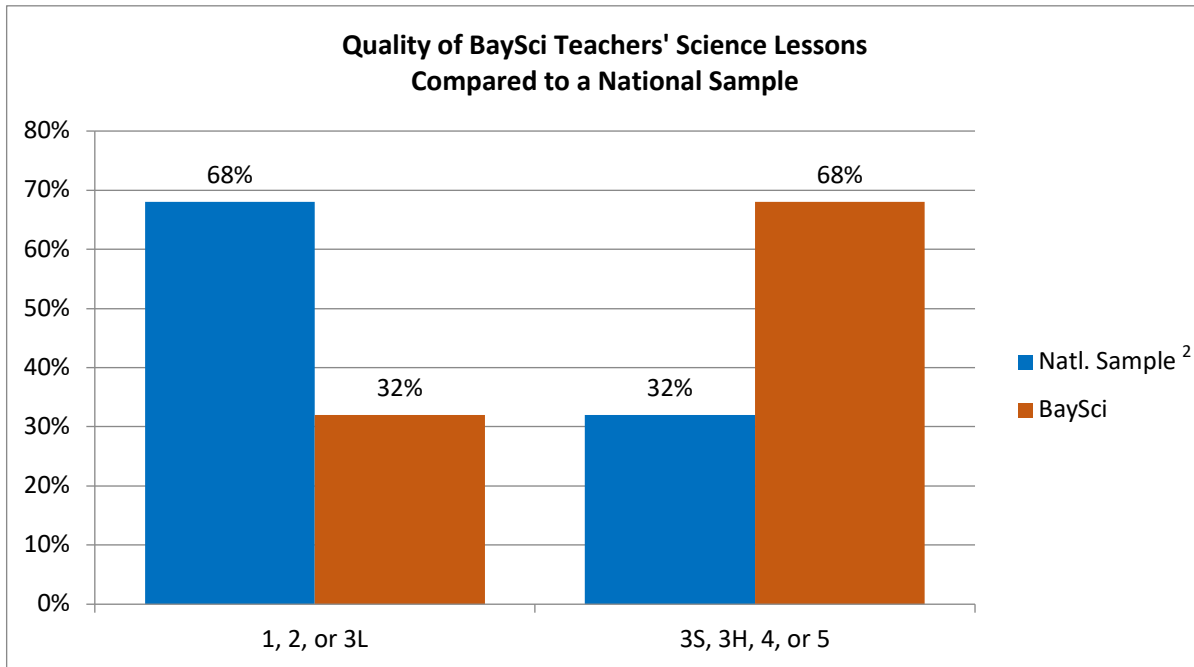
Increased Quality of Science Lessons in BaySci Districts: Comparison Over Time



(Percentages shown are based on a scale of 1 – 5, where 1 = ineffective instruction and 5 = exemplary instruction. The middle rating (3) has three options: 3-low (3L), 3-solid (3S), and 3-high (3H).

For the observations of BaySci classrooms, Inverness researchers used an observation protocol originally designed and normed for a national study of math and science classrooms.² This allowed us to make comparisons of quality of BaySci science lessons to a national data set.

The graph below shows that in 2013, science lessons in BaySci districts had a substantially higher number of solid to high-quality lessons (68%) than the national sample (32%). The impact of BaySci is to “raise the floor” so that all students are more likely to receive a steady diet of quality science instruction.



(Percentages shown are based on grouped ratings on a scale of 1 – 5, where 1 = ineffective instruction and 5 = exemplary instruction. The middle rating (3) has three options: 3-low (3L), 3-solid (3S), and 3-high (3H).)

- **Realizing the vision described in the Next Generation Science Standards (NGSS)**

BaySci helps districts implement the Next Generation Science Standards through the creation of a curricular vision and professional learning plan and by improving science instruction and classroom learning environments in ways that align with the NGSS.

100% of district survey respondents agree with the following statement:

Because of the BaySci network and support, my district has made more progress in improving its science/NGSS education program than if we had not been involved.

Our work and training with BaySci has been pivotal with our transition to NGSS. Specifically, they have provided norms, training for the leadership team to provide effective support to key players (teachers, parents, admin) in the district. In addition, it has provided a forum for our district to meet and discuss key goals and the means to achieve said goals. Furthermore, our meetings have provided us the opportunity to learn best practices from other districts/educators.

District Leader

² National sample is from a 2003 Horizon Research report, “Looking Inside the Classroom,” which utilized the classroom observation protocol to rate hundreds of mathematics and science lessons across the country. See <http://www.horizon-research.com/insidetheclassroom/reports/looking/appendixc.pdf>, p. C-24.

3. BaySci Support Helps Districts Build Momentum & Develop and Sustain Their Science Program Improvement Efforts

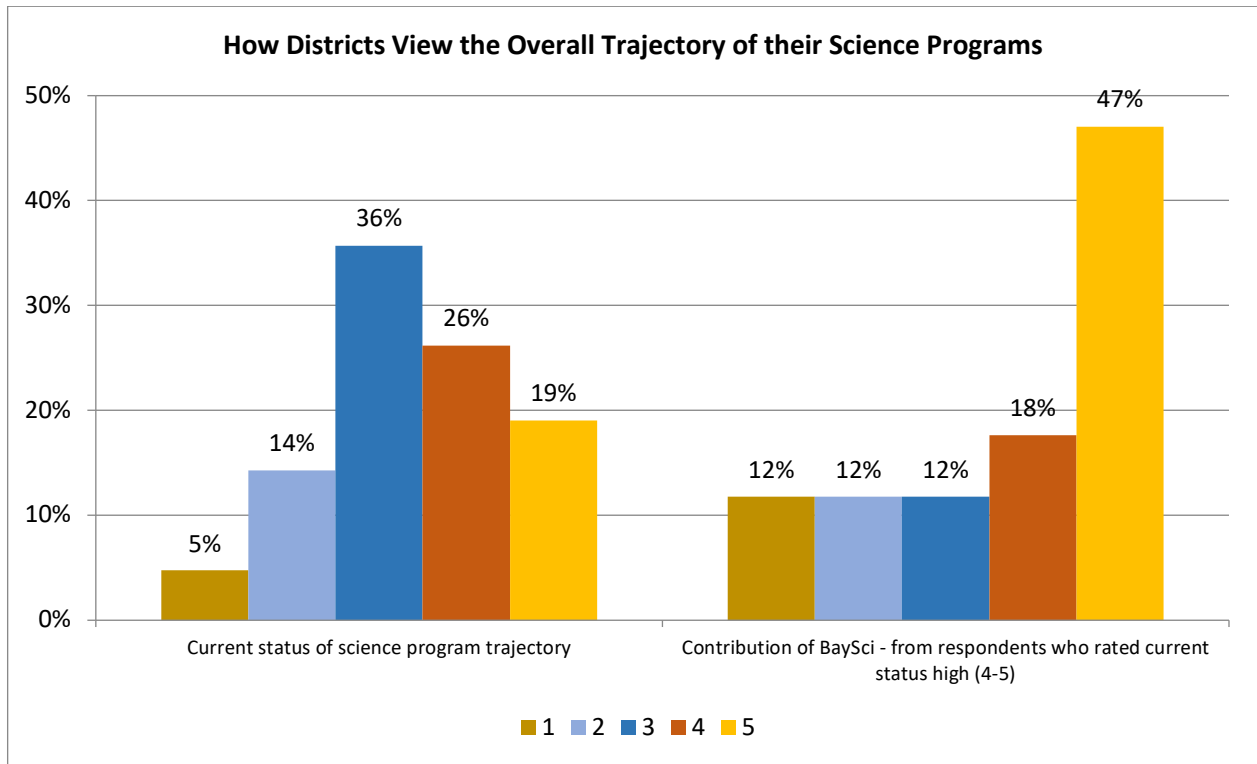
Within any school district at any given time, there are many initiatives underway to improve instruction. In fact, many schools and teachers suffer from what has been called “initiative fatigue.” Too often the result is that change efforts are short-term, episodic, local, and they rarely affect the underlying system that supports instruction.

Because BaySci is an external organization, it offers a continuing and steady partnership to districts over time. It can help districts continue the work of improving science even when there are inevitable changes in leadership, priorities, and policies that may distract from improving access to high-quality science education.

The focus on science, technical knowledge, and support for change has been invaluable. The planning meetings help move us forward; I don't think we would have anywhere close to the amount of progress without them.

District Leader

The graph below shows how participants perceive the overall trajectory of the science program in their districts. Eighty-one percent reported that the overall trajectory, or improvement, of their science program was medium to high (3, 4 or 5). Nine out of ten responded that BaySci has contributed to their current status, and 65% who rated their current status 4 or 5 said BaySci has made a large or significant (4 or 5) contribution to that status.



(Percentages shown are based on a 1-5 rating scale. For “Current status”, 1 = low, 3 = medium, 5 = high. For “Contribution of BaySci to current status”, 1 = no contribution, 3 = some contribution, 5 = significant contribution.)

4. BaySci Helps Districts Develop Long-Term Capacity for Science Education

BaySci has two goals in mind as it supports school districts. One is to help districts directly and concretely improve science programs, science instruction, and science learning. The second is to help districts over time to increase their own capacity for ongoing improvement and sustainability of new programs and activities. This systemic focus is what sets BaySci apart and how BaySci seeks to create a sustainable long-term impact.

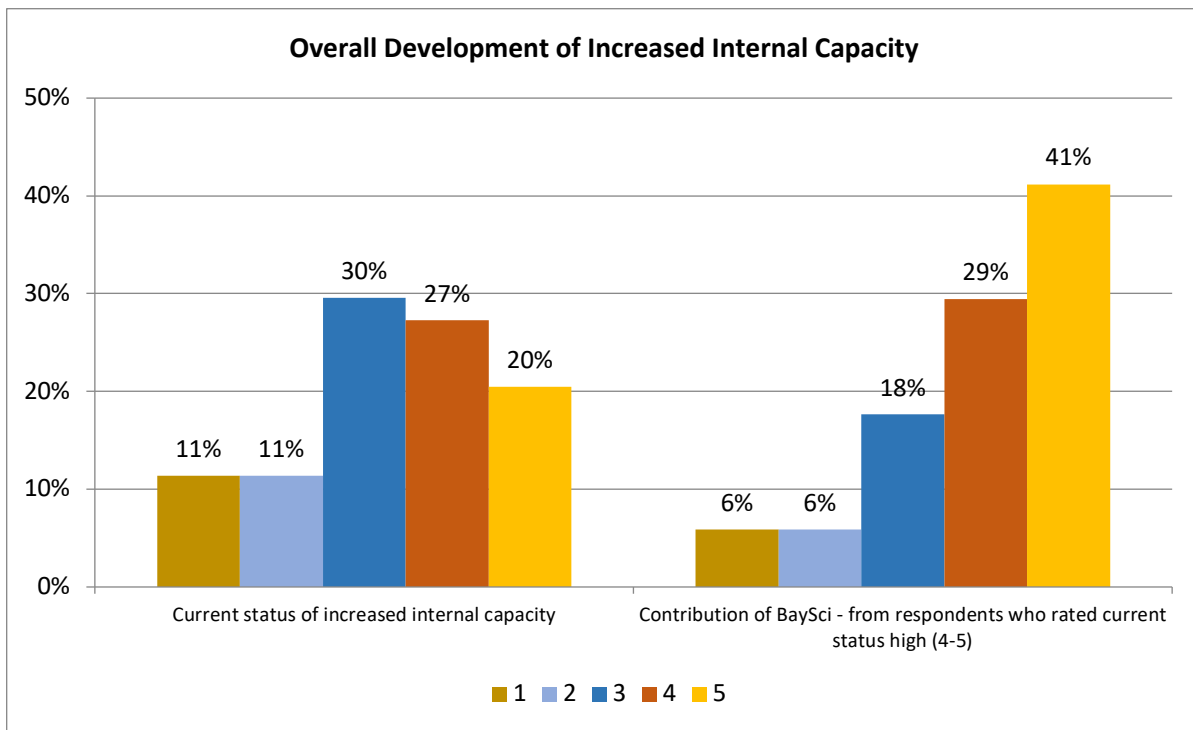
BaySci helps district leadership teams carve out valuable time to meet, work, and learn together alongside other districts tackling the same issues. This allows the leadership teams to not only build capacity for their own district leadership but also to gain valuable insights and create relationships with other districts that can help sustain the focus on science improvement at the administration level.

The time BaySci has given us for district team planning has been invaluable. You've helped us to navigate difficult conversations. Although there's lots to do, we are moving in the right direction, and your support has been instrumental.

District Leader

The graph below shows how districts evaluate their own capacities to improve their science programs and how much districts credit BaySci with helping them build their own capacity to work on districtwide science improvement efforts.

Seventy-seven percent reported that the degree to which their district has developed their own internal capacity for initiating and sustaining a science education improvement was medium to high (3, 4 or 5). More than nine out of ten districts responded that BaySci has contributed to the current status of their increased internal capacity, and 70% of those who rated their current status 4 or 5 said BaySci has made a large or significant (4 or 5) contribution to that status.



(Percentages shown are based on a scale of 1 to 5. For "Current status," 1 = low, 3 = medium, 5 = high. For "Contribution of BaySci to current status," 1 = no contribution, 3 = some contribution, 5 = significant contribution.)

SUMMARY STATEMENT

Inverness Research studies the investments made in education improvement programs. For over ten years, we have worked with BaySci to help them improve, as well as document, the contributions they are making to district science education systemic reform.

BaySci provides customized support, expertise, tools, and resources to districts with the goal of improving the quantity and quality of their K–12 science programs. BaySci offers districts a place to work on science in a dedicated and supported fashion, and to share with and learn from other districts involved in similar efforts.

We have observed district leadership seminars and classroom teaching. We have interviewed and surveyed teachers, administrators, and other instructional leaders for science in the districts. We have observed BaySci districts sharpening their vision of their science programs, developing districtwide science implementation plans and developing distributed leadership for science education across the district.

All of this leads us to the conclusion that BaySci is a sophisticated, leveraged investment that allows districts to increase their overall capacity for high-quality, equitable science teaching. Over the years, we have seen many BaySci districts increase the visibility and priority of science, develop instructional visions and practices that are aligned with NGSS, and increase both the quantity and quality of their science teaching.

BaySci has been invaluable in increasing our understanding and developing our capacity... as well as creating connections with other districts. It has been amazing in supporting our science vision, our staff development, and now our environmental literacy.

District Leader

I think it is important to have the expertise of BaySci... I also think it is important for practitioners to see that others are doing the same work and to learn from what other districts are doing... I think it is really important for superintendents to hear from one another and from teachers at the elementary schools to hear from one another—that really helps with enriching our vision and our human capital development...

Bay Area Superintendent & BaySci Participant

BaySci has effectively supported science improvement in our district in various ways. In the early stages, BaySci helped our district develop a mission and a plan for science. Our mission and plan was adopted by the board and now serves as a “runway” for the direction of the growth of our science program. In addition, BaySci has provided teachers with invaluable training that they can directly infuse into their classroom instruction and planning. Teachers have had opportunities to become teacher leaders. These teachers have taken on leadership roles to provide staff development opportunities in our district and have mentored other teachers with the transition to NGSS. Furthermore, our work with BaySci has provided us with opportunities to network and learn from best practices from other districts and key people within the science community. It has been an incredible journey and I hope we can continue it!

District Leader

BAYSCI DISTRICTS

BaySci supports a network of school districts committed to improving their K-12 science programs. BaySci is a partnership among science education leaders, districts, schools, and teachers who are committed to improving the quantity and quality of K–12 science teaching to provide meaningful access to equitable science learning opportunities in California districts and schools. For over a decade, BaySci has worked with more than thirty Local Educational Agencies (LEAs)—districts, schools, charter management organizations, etc.—many with high-needs student populations (e.g., Free & Reduced Lunch, English Learners, Students with Disabilities). The districts vary in terms of student demographics and represent a range of sizes and locales—from large, urban districts to small, suburban and rural. The BaySci network is comprised of district leaders, school administrators, teacher leaders, and teachers from the following districts, schools, and county offices of education:

Adelante Charter School	Oakland Unified School District
Alameda Unified School District	Orinda Union School District
Berryessa Union School District	Pacific Elementary School District
Bonny Doon Union Elementary	Pajaro Valley Unified School District
Carpinteria Unified School District	Palo Alto Unified School District
Cloverdale Unified School District	Peabody Elementary School
Cold Spring School District	Petaluma City Schools
Covina-Valley Unified School District	Redondo Beach Unified School District
Emery Unified School District	San Lorenzo Valley Unified School District
Happy Valley Elementary School District	San Mateo-Foster City School District
Hope Elementary School District	Santa Barbara Charter School
Live Oak School District	Santa Barbara Unified School District
Montecito Union School District	Santa Clara Unified School District
Mountain Elementary School District	Santa Cruz City Schools
Napa Valley Unified School District	Santa Cruz County Office of Education
Newark Unified School District	Sonoma County Office of Education
Novato Unified School District	Scotts Valley Unified School District Office

DATA SOURCES

Inverness Research findings are gathered from multiple sources of rich and varied data. We attended many BaySci District Leadership Team seminars, conducted BaySci site visits with central office administrators, interviewed district science leaders and school principals, observed classroom teaching at all elementary grade levels in BaySci schools, conducted pre- and post-interviews with teachers we've observed, and surveyed District Leadership Teams.

Inverness Research, a national education evaluation and consulting group headquartered in Northern California, has over 25 years of experience studying local, state, and national investments in the improvement of education.

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