

THE CONTRIBUTIONS TO TEACHERS

How Teachers Were Empowered to Support Students Learning Science and Developing English Language Fluency

*I am happy to be part of an inquiry-based learning, student-driven curriculum and activities that allow students to discover things and create their own meaning, all the while receiving language arts and science instruction.*¹

~ SVUSD elementary teacher

The Integrating English Language Development (ELD) and Science program, a partnership between the Exploratorium and Sonoma Valley Unified School District, offered elementary students wide-ranging opportunities to interact with and make meaning of natural phenomena through science inquiry. The program had two major educational purposes: 1) to teach science content, practices and thinking skills to students, and 2) to simultaneously stimulate, accelerate and expand their language development. Funded by the U.S. Department of Education through the Investing in Innovation Fund (i3) the Integrating ELD and Science program took a synergistic approach to the historically persistent and intractable problem of “closing the achievement gap” of limited English proficient students.

What Is the Partners in Innovation: Integrating ELD and Science program?

The goal of the Partners in Innovation: Integrating ELD and Science program was to enhance K-5 students’ English Language Development and science learning. Over five years the program promoted the implementation of an integrated ELD and science instructional approach by providing concrete supports to teachers in four critical dimensions: curriculum, professional development, professional learning community, and district backing. With its focus on learning language in the context of hands-on science, the program aimed to establish a robust, districtwide elementary science program as well as to accelerate the language development of its English Language Learners.

What was the integrated ELD and science approach?

The integrated approach purposefully combined two essentials:

- 1) science, taught with a hands-on inquiry-based approach, and
- 2) language development, viewed as a social process between learners and speakers of the language with emphasis on comprehending and expressing meaning rather than on flawless form.

The pedagogy underlying this innovative approach presented to SVUSD teachers centered on the premise that making sense of the natural world through child-centered learning experiences motivates students to share their thoughts, generates many ways for them to encounter science ideas and practices, and provides multiple occasions for them to hear and use language in context. The intended result, as they pursued their observations and questions and started making meaning of their experiences, was for students to learn science and language through a mutually beneficial synergy.

¹ Quotes are taken directly from interview transcripts and edited for both grammatical correctness and readability. The integrity of the quotes has been maintained; intent and meaning have not been altered.

What was the role of the classroom teacher and why was it so important?

Both common sense and educational research conducted over the past several decades suggest that the classroom teacher is the linchpin to educational improvement efforts that seek to enhance student learning. What students learn in school depends on their teachers' instructional priorities, and on what their teachers know and can provide in their classrooms. The adoption of an integrated ELD and science instructional program aimed at "closing the achievement gap" of second language learners was the goal of the Partners in Innovation grant, and teachers were the key. Since integrating ELD and science teaching was a promising but novel approach, the major thrust of the program was on the professional development of the roughly 100 elementary teachers in the district.

The challenges the program faced providing teachers with professional development were those indigenous to elementary schools across the country. SVUSD was no exception. First, it is widely recognized that science is almost always relegated to the instructional backburner in elementary schools. There is little time in the K-5 school day for science. For the most part elementary teachers lack discipline knowledge in science and, as a result, they have little confidence in their own capacity to teach it well. The elementary teachers who know, like, and do teach science to their students are few and far between. In addition, though much better versed in the language arts, elementary teachers are not necessarily familiar with second language acquisition. A final challenge for the new program was to provide teachers with experiences that would enable them to understand the integrated approach and to appreciate its efficacy.



What were the major professional supports the Integrating ELD and Science program provided teachers? In what ways would teachers benefit?

The diagram on the following page shows the supports the Integrating ELD and Science program provided SVUSD teachers (in green), as well as the teacher capacities and benefits the supports were intended to influence (in blue). These supports were intended to remove many of the barriers that SVUSD elementary teachers were likely to face as they embarked on a new, innovative way of teaching English language development and science.

District Supports

Active administrative backing for
the Integrating ELD and Science program

Expectations for teachers

Release teacher for Program Coordinator position

Materials Center

Community engagement, support and funding



Curriculum + Materials Supports

Curriculum and teacher's guides

Kits and materials



Professional Development Supports

Learning: curriculum + kits + materials

Grade-level meetings and conversations

Key strategies: Science Talk and Science Journals

Learning: science inquiry + science content + language acquisition



Expanded Teacher Knowledge and Thinking

Confidence

Science content and science inquiry

Second language acquisition and language development



Expanded Teacher Instructional Practices

Creating positive classroom environments

Integrating ELD and science

Teaching science and science inquiry

Facility with and refinement of key strategies



Professional Learning Community



Teacher Leadership

This summary view of the chief supports for teachers and their resulting benefits is not based on either the developers' or the district's perspectives. Rather, it reflects the teachers' views and relies on administrator and teacher interviews, teacher survey data, professional development, and classroom observations that Inverness Research and the Research Group at the Lawrence Hall of Science conducted over the duration of the Integrating ELD and Science program.

What was the nature of the district supports for teachers?

- ✓ With the Exploratorium, the Sonoma Valley Unified School District was one of the two partners instrumental in initiating the Integrating ELD and Science program. From the very beginning the district, especially the superintendent, provided very strong backing for the innovative approach to better instructional programs for English Language Learners.
- ✓ The district's expectations for teachers regarding their participation in the program were high. All teachers were expected to teach using the integrated ELD and science approach. As the district's instructional leader, the superintendent directed that all five elementary schools and all 100 teachers would be included in the program offerings. A teacher commented, "It is expected of us, and we teachers hope it helps our ELLs progress in their English skills."
- ✓ The district also affirmed the importance of science teaching, substituting the Integrating ELD and Science program for its more traditional textbook program. "We are lucky that we have all the support we need for teaching science," said a teacher who was one of the first involved in the program.
- ✓ The district released a veteran teacher to serve in a Program Coordinator position to make the program function effectively. The coordinator helped to organize and distribute materials, support individual teachers with additional resources and materials, co-teach and coach in classrooms, and serve as the spokesperson for the program.
- ✓ In addition, the district supported a materials center where the i3 kits and other materials were stored, refurbished, and distributed to teachers.
- ✓ Finally, the district and especially the superintendent helped garner recognition, involvement, and other support, particularly funding, from the community at large.

What was the nature of the curriculum and materials supports for teachers?

- ✓ Perhaps the greatest support the program provided for teachers was a curriculum that exemplified the innovative approach they were asked to teach. The Exploratorium developed two units aligned with the Next Generation Science Standards (NGSS), including a teacher's guide and materials kit for each grade level. Units centered on inquiry-based explorations into enticing natural phenomena such as Snails or Shadows or Magnetism. Teachers could get started right away with integrated instruction without having to invent it themselves.
- ✓ Of special importance was that the program provided teachers with readily available science kits, including all the materials necessary for students, i.e., everything teachers needed in one convenient place. They did not have to think through, purchase, or scrounge materials for their classrooms.

What was one of the greatest benefits for me?

That's easy, it was the kits! Having ready-made, ready to go, very hands-on, very engaging science kits for my classroom. There was some preparation, but not a lot, and having those materials completely ready at my fingertips, with both the background information that was very thorough and very well-written lesson plans in the teacher's guide ... Having it ready to go, with everything counted out, prepared, easy to store, easy to clean up. It sounds kind of mundane, but that was huge for me. And that's in contrast to what we teachers usually get—just reading something and then having to pull everything together myself.

What was the nature of the professional development supports for teachers?

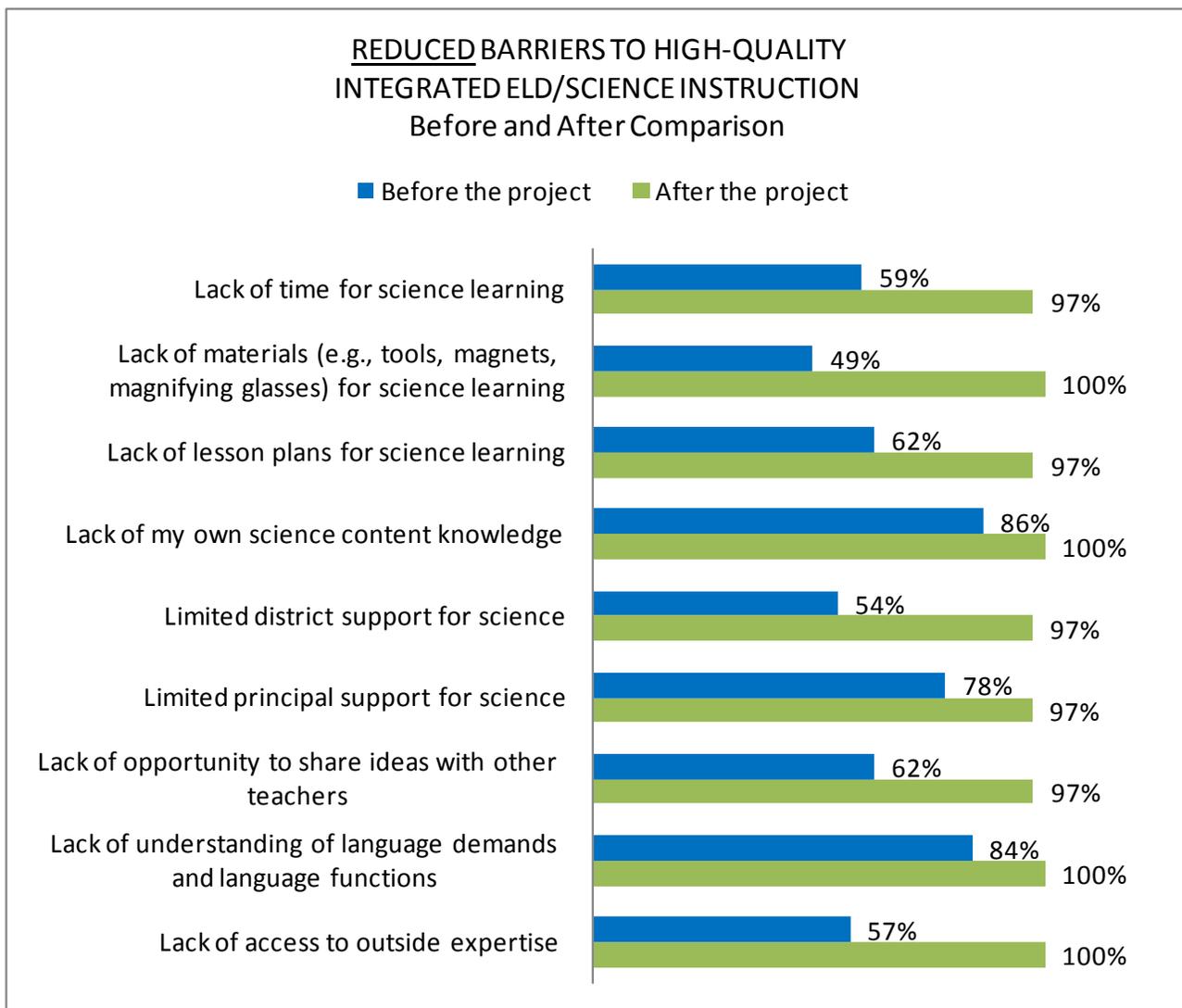
- ✓ Through the Exploratorium teachers had access to professional development that focused primarily on the implementation of the grade level units provided by the program. With the guidance of the Exploratorium staff teachers examined their kits, reviewed the teacher's guides, and, then after teaching in their classrooms, came together to share their experiences.
- ✓ Large portions of the professional development sessions were organized into grade-level meetings, where teachers from across the district and over the course of several years had multiple opportunities to talk with one another about how the integrated ELD and science approach was working, how the curriculum played out in their classrooms, how they had encountered and resolved instructional problems, and how they had created additional activities and materials aligned with the curriculum.

I got to learn from other colleagues from my own school as well as the district. The collaboration and sharing of ideas was beneficial because I got to learn from other teachers who were doing the same thing I was ... we were all learning by doing, figuring out the program together ...
- ✓ The professional development provided teachers with two key strategies for integrating ELD and science—the Science Talk and the Science Journal. These core strategies were used in every unit at every grade level. At first challenging for many teachers, as the program evolved teachers became more experienced users, relying on these core activities to integrate language and science.
- ✓ The professional development also offered teachers their own science inquiry experiences where, as adults, they examined scientific phenomena. They had opportunities to observe and interact with phenomena first hand, and then to go on to pose their own questions and hypotheses, learning about both science content and science practices along the way. In addition, the professional development provided teachers with greater understandings of second language acquisition and language development. The intention was to support teachers in knowing what to do, as well as why to do it.

The writing component in the Science Journals we used throughout the investigations was very beneficial. A lot of the investigations were just fun, so I wondered as I was watching my students just how much they were really getting out of it. Then when I actually saw their Science Journals or we heard what they had to say in the Science Talk—I knew they had learned a lot.

How effective were the supports for teachers?

The teacher survey data displayed below shows the effectiveness of the program's supports for high-quality integrated ELD and science instruction in SVUSD. District backing, curriculum and materials, and professional development formed a comprehensive set of supports for teachers. They were deliberately designed to help alleviate many of the barriers elementary teachers typically face when teaching science and teaching in an innovative way, and SVUSD teachers found those barriers to their teaching greatly reduced.



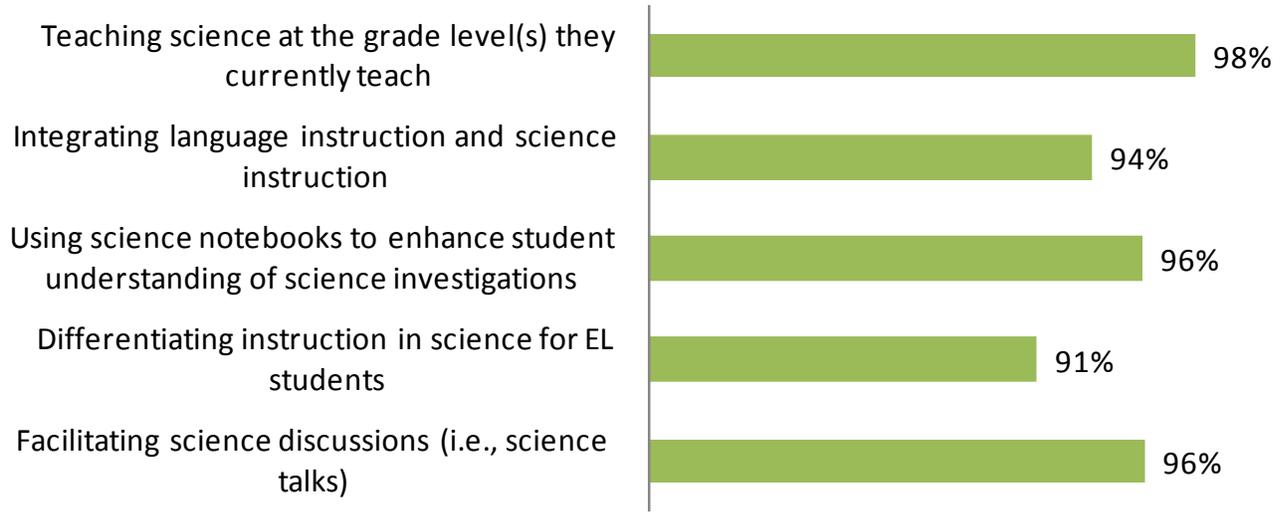
NOTE: Percentages represent teachers who gave a 3, 4, or 5 rating based on a scale of 1 to 5, where 1 = "an almost impossible barrier" and 5 = "no barrier."

What effects did the program have on the nature of teacher knowledge and thinking?

- ✓ Most teachers reacted to the program very enthusiastically because they saw their students, especially their ELL students, responding to what they were teaching with excitement, motivation, and a profusion of language. In this sense the Integrating ELD and Science program provided teachers with successful and effective teaching experiences, which in turn gave them confidence in their instructional efficacy.

Like the teacher who said, “I feel much more confident teaching science and appreciate the more interesting and interactive lessons that are so much better than our past science curriculum,” SVUSD teachers at large reported much greater self-confidence teaching integrated ELD and science after participating in the program.

CONTRIBUTIONS TO TEACHERS' GROWTH IN CONFIDENCE FROM INVOLVEMENT WITH THE PROJECT



NOTE: Percentages represent teachers who gave a 3, 4, or 5 rating based on a scale of 1 to 5, where 1 = “No project contribution to my growth” and 5 = “Very great project contribution to my growth.”

- ✓ Primarily through workshops held at the Exploratorium, teachers learned science content through their own personal adult-level science inquiry experiences. For most, learning in this way was a novel experience. It gave teachers both an understanding of the pedagogical foundations of the Integrating ELD and Science curriculum, as well as insight into and empathy for their students’ learning processes.
- ✓ SVUSD teachers reported that as a result of their participation in the program they understood better the way second language is acquired as well as the language development of their ELLs and their special needs. On the following page are three samples among many testimonials from teachers that illustrate this understanding.

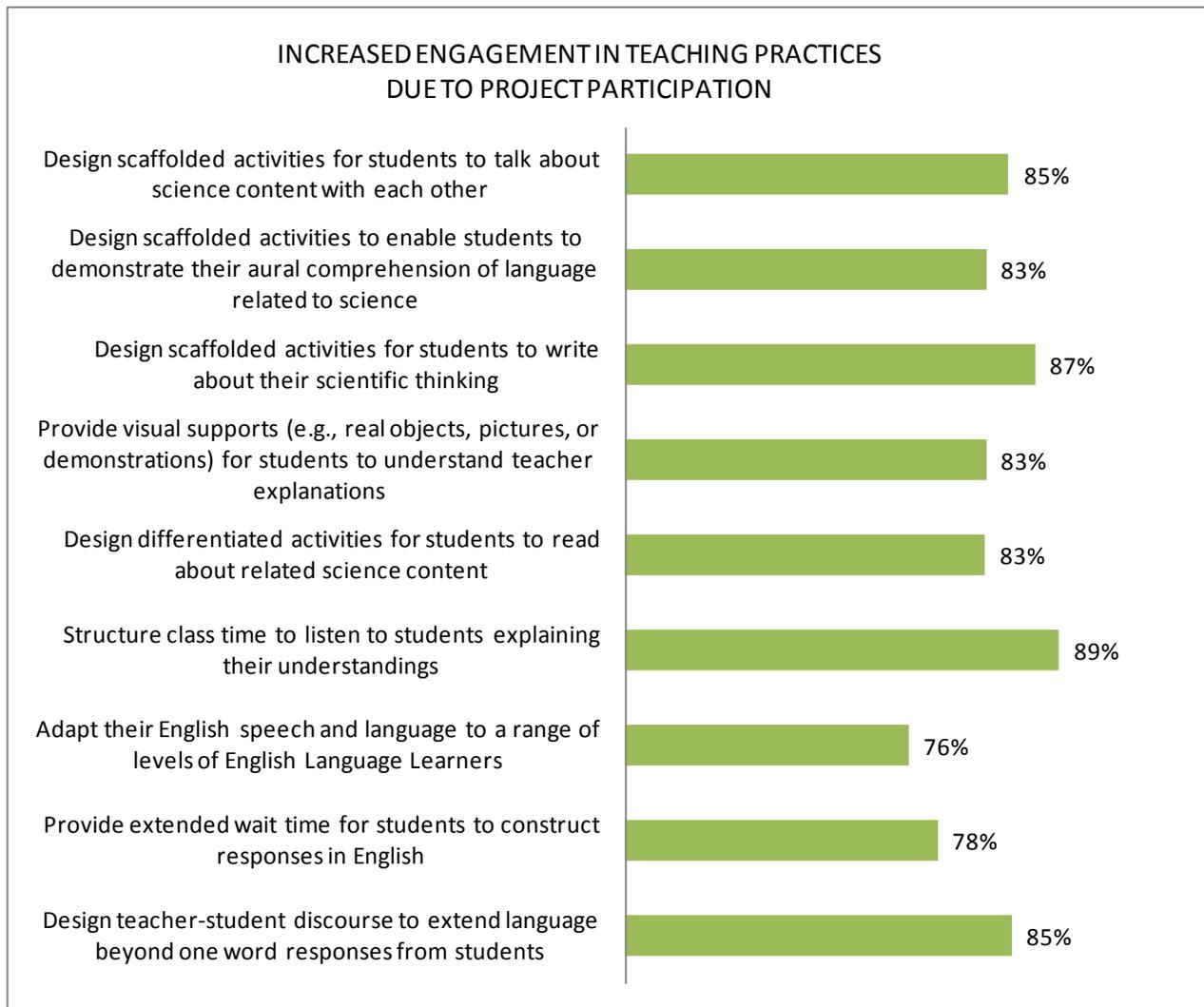


- *I learned how important it is for children to learn language indirectly through interesting content and experiences with peers and adult facilitators.*
- *The program has made me aware of the challenges faced by language learners and how much scaffolding is really needed to help them master concepts. It really makes me slow down and put more attention and focus into my lessons, specifically in how I will provide enough opportunity to practice language while also learning science.*
- *The program has made me focus much more on using oral language in the small group talks and whole class science talks as a way of developing understanding of concepts. It has also shown me the value of repeated opportunities to speak and practice using content vocabulary, especially before attempting any written work.*



What effects did the program have on teachers' instructional practices?

- ✓ It was easy to see the Integrating ELD and Science program realized in SVUSD classrooms. Almost all the class observations conducted by researchers revealed classroom environments that were very positive. Teachers and students treated one another with respect and kindness. Walls and white boards were covered with student work, vocabulary words, and science charts. Rooms were abuzz with conversations and discussions. Students were actively engaged in science inquiries and teachers were actively engaged in assisting them.
- ✓ As can be seen from the results of the teacher survey below, teachers took to heart the activities and strategies they were learning through the program. Their usage of practices to support science and language development were high.



NOTE: Percentages represent teachers who gave a 3, 4, or 5 rating based on a scale of 1 to 5, where 1 = "The project hasn't affected the frequency with which I engage in this practice at all" and 5 = "Because of the project, I engage in this practice much more often."

This 3rd grade teacher involved in the program from the very beginning summarized the kinds of influences her participation had on her teaching practice:

The program gave me confidence teaching science and inquiry that I didn't have before. It also gave me a more beneficial vehicle and approach for teaching language. And then it

provided not only multiple learning opportunities for me to reflect on my teaching practices and teaching methods, but also it gave me new things to try with my students. That provided new learning opportunities for them and I feel that it opened up a whole new world to my students that wasn't open to them before.

What effects did the program have on professional learning community?

- ✓ Almost always teachers remain isolated in their classrooms without the benefit of professional interactions and dialogue. The Integrating ELD and Science program offered SVUSD a welcome antidote. Through its 5-year duration, the program helped create a professional learning community for teachers. Through summer institute experiences, monthly meetings, and grade level get-togethers teachers had opportunities for collegial learning and reflection, and both individual and collective knowledge building.
- ✓ The professional learning community that evolved through the program was focused on instructional improvement on a very specific topic—integrated ELD and science instruction. As a result, an important body of practitioner knowledge about integrated teaching, held by the teacher community and constantly expanded and refined through sharing and discussion, developed and exists in the district today.
- ✓ Teacher comments from the surveys reveal why teachers valued the community of colleagues and learners that emerged from the program:
 - *(It is valuable to) talk in groups with your colleagues who are teaching the same thing.*
 - *The time for sharing what works and what doesn't work is very helpful.*
 - *(Teachers participate in the improvement cycle because they) bring questions that other teachers can help answer and provide information on how to do things differently or better.*
 - *The program is helpful in maintaining connections so that if any questions come up there is always someone to help out with the lessons.*
 - *The collaboration with other teachers is amazing.*

What effects did the program have on developing teacher leadership?

- ✓ The program offered teachers a range of leadership roles and activities centered on sharing innovative and best practices. As the program progressed, many classroom teachers contributed to the professional events, e.g., sharing strategies or practices they had developed or leading grade level discussions. Many also took active leadership roles at their schools, advocating for the program, communicating with parents, and promoting the pedagogical approaches embedded in the Integrating ELD and Science program. A handful of others took on very prominent roles, serving as presenters or speakers at conferences and national level meetings describing the program to sophisticated audiences. Teachers explained:
 - *For me there were very many benefits to being part of the program ... I became a teacher leader, and that was very beneficial. I got to step into a different role in the district and with the Exploratorium. I got to help a lot more people, and for me, that's a real benefit.*

- *Though I wasn't a teacher leader with this program, I was grateful that some of my colleagues stepped into that role. It was enlightening to see videos and student work from other classrooms, to be able to ask questions and to see that it's an ongoing learning process for all of us involved.*
- *Teacher leadership? There were totally great opportunities, and I feel very grateful because to be acknowledged professionally, even outside your own school or district is wonderful ... To have the Exploratorium tell us they thought we were doing good work, and to ask us to come and share with other teachers around the Bay Area—great!*



The following 5th grade teacher summarized the contributions of the Integrating ELD and Science program to her and to her other SVUSD colleagues.

The biggest contribution was of course having a stocked kit, ready to go with well-designed lesson plans. In the past, if we wanted to teach science, we teachers were forced several times a week to scrounge up materials on our own, with our own money to make lessons more meaningful for our students. Because the majority of my students are second language learners it's been critical to include realia and to provide experiences where students will be

so engaged they remember the content as well as the experience. This integrated curriculum is appropriate for my students and I don't have to run around trying to find miscellaneous items at the last minute to make it meaningful.

The professional development afforded us the luxury of time meeting with colleagues who were working on the same units. Throughout the past two years I've benefited from the wisdom of my fellow teachers and have learned so much from our Exploratorium visits, from University of San Francisco professors, and from all of the coaches. Unlike many other professional development days the Integrating ELD and Science program days didn't feel mandatory or obligatory. They felt like meaningful opportunities for growth. Listening to another teacher who has similar circumstances to mine—overworked, with challenging students and limited time in the school day, etc.—share their excitement over the project was inspiring. I got to know some other teachers from schools that I might not have crossed paths with in the past, and now I feel that I can drop them an email to ask a question or to share something I found helpful.

And of course the greatest contribution to me as a teacher is that the program enables me to contribute to my students ... it guaranteed that more science was taught and explored in the classroom. It got us ALL beyond the book and into the inquiry. It helped us to develop discussion facilitation skills that were carried back into many other subjects. It empowered students to believe that they could ask a question and engage in meaningful research and investigation to answer the question.

Partners in Innovation: Integrating ELD and Science
Exploratorium/Sonoma Valley Unified School District

Project Portfolio

INTRODUCTION AND OVERVIEW
The Innovation and Its Contributions

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→ WHAT ARE THE CONTRIBUTIONS TO TEACHERS? ←

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STUDENT PROGRESSIONS IN SCIENCE AND LANGUAGE DEVELOPMENT:

An Introduction and Rationale
Progress in Developing Positive Attitudes and Confidence
Progress in Learning Science Content
Progress in Developing Science Practices and Thinking Skills
Progress in Developing Language Fluency and Complexity

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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