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# **The Gilbert Elementary Science Program**

*The Infrastructure Needed  
to Sustain High Quality  
Instruction*

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This evaluation brief is supported by the National Science Foundation as part of its Local Systemic Change Initiative. The brief highlights the accomplishments of the Gilbert Local Systemic Change project and describes the current status of elementary science teaching in the Gilbert, Arizona School District. The brief also identifies three key capacities that are needed to maintain the Gilbert elementary science program and to avoid losing the value of the NSF investment that has been made in the district.

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## Executive Summary

The Gilbert School District, with the support of a National Science Foundation Local Systemic Change (LSC) grant, has implemented a district-wide elementary science program that is now capable of serving all of the districts' young students. The essential components of the elementary science program are these:

- ◆ A standards-based science curriculum for grades K-6. This curriculum is supported by three or four science kits at each grade level.
- ◆ An instructional materials center that is able to provide each elementary teacher in the district with all the materials he or she needs to teach the district science curriculum.
- ◆ A professional development program offering a wide array of workshops designed to support teachers in learning how to teach the kits and use the best pedagogy to help students understand science content.
- ◆ A science coordinator, science resources teachers, and lead teachers at each school.

Over the past five years both the quantity and quality of elementary science teaching in Gilbert has increased dramatically. The LSC project has evolved into a strong district-owned elementary science program that is highly valued by both teachers and students.

The National Science Foundation (NSF) grant provided the district with an infusion of financial resources. These resources were essentially an investment in the start-up costs for developing the district's elementary science program. Now with NSF funding ending, the district has the opportunity to invest in a set of supports that can capitalize upon and leverage the investments made to date. These supports comprise what we call a program infrastructure and include three main components: 1) leadership; 2) curriculum and materials; and 3) professional supports. A low level, ongoing investment made by the district can be a very cost effective way to sustain the investment already made by NSF and the district. If the district can provide steady funding to ensure ongoing support in each of the three critical areas, then the high-quality science program now in place can be continued for many years to come.

## Background

Research studies<sup>1</sup> show that, across the United States, elementary science is a subject taught sporadically and with very uneven quality. The reasons for the dearth of good science teaching are many. Most U.S. school districts are simply lacking the critical capacities needed to develop and support a high-quality science program. They do not have large numbers of teachers with expertise in science teaching; they do not have a coherent curriculum that is well supported with high-quality instructional materials; and they do not have an array of supportive professional development offerings that can help teachers and administrators improve the science instruction in their schools. In addition to lacking these capacities, many districts are feeling pressure from No Child Left Behind and other accountability policies so that they emphasize the teaching of mathematics and reading at the expense of science.

We began our study of the Gilbert elementary science program over five years ago. Even then Gilbert was not a typical U.S. school district. Modeling itself after the science program of the nearby Mesa School District, Gilbert had already initiated the development of a “kit-based” elementary science program. Under the leadership of Susan Giesaking, Gilbert School District used this early work as a catalyst for gaining a LSC grant from the NSF.

### **Gilbert followed the NSF LSC model closely in developing its elementary science program**

The NSF LSC initiative<sup>2</sup> was designed to help districts develop the capacities needed to offer high-quality mathematics and science programs to their students. NSF LSC grants helped local districts pursue improvements based on the following assumptions:

- ◆ Student achievement depends heavily upon the quality of instruction to which students have access.
- ◆ The quality of instruction, in turn, depends on the supports districts are able to offer teachers.
- ◆ District-wide supports need to include a high-quality curriculum with well designed materials.
- ◆ Teachers need ongoing professional development in order to learn to use the instructional materials, as well as to better understand the underlying science content.
- ◆ Districts can use the resources of the LSC grant to develop their science programs, and then use district funds to provide the program supports needed to sustain the program.

The Gilbert LSC has closely followed the NSF model. The district has designed and refined a science curriculum for grades K-6. Importantly, this curriculum was aligned with state and national standards. At each grade level, the teaching of the curriculum is supported by three or four science kits that contain all the needed instructional materials. The LSC resources were also

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<sup>1</sup> *The 2000 National Survey of Science and Mathematics Education: Compendium of Tables.*  
[http://2000survey.horizon-research.com/reports/tables/tables\\_complete.pdf](http://2000survey.horizon-research.com/reports/tables/tables_complete.pdf)

<sup>2</sup> See *The LSC Capstone Report: Lessons From a Decade of Mathematics and Science Reform.* (2006).  
<http://www.pdmathsci.net/reports/capstone.pdf>

used to design and implement a writing program that is closely integrated with the science program.<sup>3</sup>

The LSC grant allowed the district to design and implement a series of professional development offerings that supported teachers in learning how to teach the kits and use the best pedagogy to help students understand science content. The program offered a wide array of workshops that ranged from helping teachers learn to use the kits, to integrate writing with science, and to understand more advanced science content.

Finally, over the past five years, the district has put in place additional supports for the elementary science program. These supports include a materials replenishment and distribution center that is able to provide each elementary teacher in the district with all the materials he or she needs to teach the district science curriculum. The LSC has also supported the development of a strong district science leadership team, teacher leaders at each building, and administrative support for the program.

The result is that now Gilbert has a coherent, strong K-6 science program which has the capability of providing every elementary student in the district with a “steady diet” of good science instruction. The changes instituted under the LSC are not longer seen as a “special project” but rather are now accepted as “the district science program.”

No longer in Gilbert does a child’s instruction in science depend entirely upon the interest and capability of the individual teacher. Evaluation data show that most of the kits are being taught in most of Gilbert’s elementary classrooms. Moreover, our observations show that the quality of science teaching is good. Overall, our evaluation work provides evidence that individual teachers are teaching more science than ever before, and they are teaching it better. We also have evidence to show that teachers value the instructional materials and the professional development they have received.

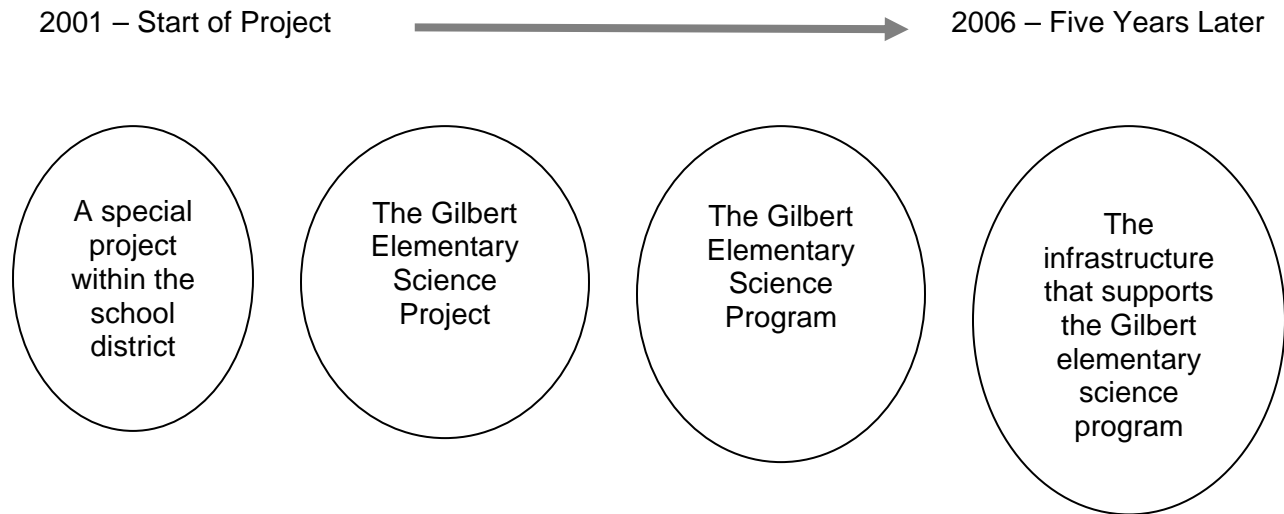
## **The Need Now for a District Science Program Infrastructure**

It may be useful to quickly summarize the transition phases through which the Gilbert science project has gone. The effort began as an NSF-funded project, quite separate from the mainstream programs of the district. As it took hold, the district began to take ownership in the effort and the kits and professional development workshops became known as the “Gilbert Science project.” Several more years led to the district project becoming the district “science program” – the curriculum all elementary teachers in the district were expected to follow. Now, as the NSF funding wanes, the district faces the challenge of “institutionalizing” the science program that has been put in place. This means finding a way to support the components of the district-level infrastructure critical to continuing the work of the program.

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<sup>3</sup> See Inverness Research Associates, *The Gilbert Elementary Science Program: Science for Writing and Writing for Science*, November 2006, which reports findings from our study of how teachers use notebooks in teaching science. It shows that student writing in science both supports better science learning and also helps students become better writers.

**Figure 1. The transition from district project to infrastructure supporting the district science program.**



### The critical components of a program infrastructure

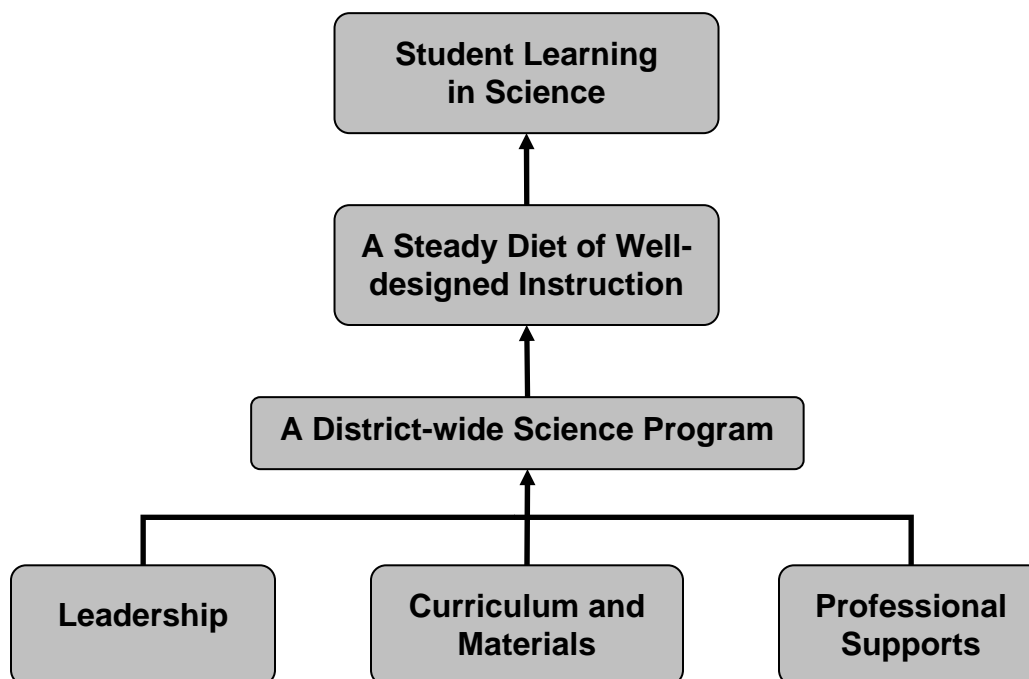
The NSF LSC grant provided the district with an infusion of financial resources. These resources were essentially an investment in the start-up costs for developing the district's elementary science program. At its height in 2003-2004, the warehouse managed, replenished, and distributed 1,895 kits to teachers, and the professional development program offered 109 workshops and served approximately 1,555 teachers.<sup>4</sup>

Now what is needed is a transition to the post-NSF funding period. It is not realistic to think the district will be able to spend the same amount on the science program as they did with the NSF funding present. It is possible, nonetheless, to capitalize on the investment that has been made. To do so, the district needs to fund the infrastructure that can continue to support the current program.

The NSF LSC resources funded the development of three critical kinds of supports that have made the program possible: program leadership, curriculum and materials, and ongoing professional development. These three kinds of supports are critical for the future sustainability of the program.

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<sup>4</sup> The number of participants in workshops were based on attendance records so the 1,555 includes repeat participants.



**Figure 2. The district science program infrastructure.**

**Leadership:** The grant helped provide resources for the leadership needed to support the current program and sustain ongoing development and improvement. Key to this work, and future work, are the following leadership positions:

- 1) **A program director** — The director needs to have expertise, experience, and commitment to the ongoing improvement of the science program. This position is essential to sustaining a high-quality science program. Susan Giesaking has filled this position with great enthusiasm and expertise. Without her, the program would not have happened, and the position is critical to the future sustainability of the effort.
- 2) **Science resource teachers (SRTs)** — SRTs are skilled science teachers who are released full time (or possibly half time) from classroom teaching. They provide a critical bridge between the director and teachers across the district. Even though they are in district-level positions, they still identify themselves strongly with classroom teachers. In so doing, they are able to provide professional development and coaching that is well-matched to teacher needs and interests. The SRTs also support the science program director, and they do much of the daily hard work of designing and implementing the professional development program for teachers and teacher-leaders.
- 3) **Lead science teachers (TLs)** — TLs are classroom teachers who are recognized and supported as being skilled in, and advocates for, the teaching of science. They provide school-based supports to their colleagues and help with the delivery of district-wide professional development as well.

Together this team sustains the program, continues to improve science teaching, and also provides the mechanism for development of future leadership for the district science program.

**Curriculum and materials:** Elementary teachers in Gilbert now have a coherent science curriculum that clearly specifies what they are to teach and how they are to teach it. The curriculum is well-supported by science kits that have been tested and refined over several years. The science materials are maintained, delivered, and refurbished by the district-supported science resource center. A well-designed curriculum and a strong materials center are critical to the future of the program.

**Professional development:** The NSF LSC grant has helped the district support teachers through professional development as they learned how to implement the district curriculum. In the future, this professional development needs to include, at a minimum:

- 1) Workshops that help teachers learn how to teach specific science units.
- 2) Workshops that help teachers integrate writing lessons with the science units.
- 3) Workshops that help teachers continue to develop their own knowledge of science and of how students learn science.
- 4) Professional supports that can help develop and support new teacher leaders and SRTs.

Together, the combination of leadership, curriculum and materials, and professional development will create an infrastructure capable of supporting the science program that has been so carefully developed.

## **Minimal investments needed to sustain a supportive program infrastructure**

The NSF grant has helped the Gilbert School District design and implement a strong elementary science program that is now serving all Gilbert elementary teachers and students. This program, as strong as it is, will not sustain itself without ongoing future support from the district. Teachers change grade levels; teachers retire and new teachers are hired; curriculum units need to be revised; key leaders retire or go back to the classroom. For all these reasons a steady set of program supports is needed to maintain and update the elementary science program.

It is important to note that the district has done much already to institutionalize two of the three supports needed to sustain the elementary science program. There is funding for leadership positions, and there is funding to operate the materials resource center. However, an ongoing source of funding for the professional development component is the one piece of the infrastructure that is lacking and most needed at this point.

Supporting the existing program, even at a low level, is far preferable to letting the program supports lapse. Recreating a successful program is ten times as expensive as maintaining the one already in existence. The following analysis suggests minimal investment levels to be made by the district to sustain a strong program infrastructure:

- ♦ **Leadership:** The leadership for elementary science is currently very strong. Susan Giesaking continues to provide leadership for the effort overall but now has assumed the responsibility of Science Curriculum Coordinator for the whole district as well. Hence, there is a stronger need than ever for the elementary Science Resource Teachers and a strong cadre of elementary lead teachers.



**Minimal investments needed:** The district currently provides support for the Science Director and two SRTs. This is probably sufficient to maintain the operation of the program, if there is also some support for the cadre of elementary teacher leaders.

- ♦ **Curriculum and materials:** A recent bond was approved to fund a new materials warehouse and professional development facility. Science kits have already been purchased by the district, but the district will need to purchase new ones to keep up with district growth and to stay aligned with the state standards at each grade level.

**Minimal investments needed:** In the area of curriculum and materials, the district will have to continue its funding of the materials center – a key component of the infrastructure needed to support the teaching of the curriculum. The district also will need to provide the salaries for the three people who staff the materials center. Fortunately, textbook funds can be used for kit replenishment and materials maintenance. In addition, the elementary science leaders will need to devote some of their time to the revision and improvement of the curriculum.

- ♦ **Professional development:** Ongoing professional development for teachers is another key to the successful operation of the program. The district does not currently have the funding needed to support professional development in science and to remunerate TLs for offering workshops outside school time. The district needs to find creative ways to offer professional development so that it maximizes its reach to all teachers and at the same time minimizes costs. For example, it may be possible to increase coordination of site-based professional development with district level science offerings. Another possibility is to organize professional development in geographic clusters of schools where grade-alike teachers who teach the same units and face the same challenges meet with SRTs and TLs. A third possibility is to structure the SRTs' time so they can begin to offer professional development to other local districts developing kit-based science programs on a fee-for-service basis. The revenue they generate could be fed back into the Gilbert science professional development program.

**Minimal investments needed:** The primary expense for professional development is for substitutes to release teachers from their classes to attend workshops. The district could maintain a program not far from the level they had with the NSF grant for an additional \$60,000 annually. Under the NSF grant in 2004-05, \$42,000 was allocated for substitutes to release teachers to attend professional development classes, \$16,000 for stipends for TLs who facilitated the workshops, and \$10,000 for professional development materials annually.

In summary, with minimal additional investment, the district can sustain the high-quality elementary science program it has worked so diligently to build and can continue to offer Gilbert students the same rich learning experiences in science and writing they have experienced in the recent past.