Researching the Sustainability of Reform

GARDEN CITY

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PROJECT OVERVIEW

The *Researching the Sustainability of Reform (RSR)* project focused on the question of how to maintain the gains of an initial educational change process and support continuing reform over time. Within the broader study of sustainability, the research paid particular attention to systemwide approaches to science education reform as well as to the role that external funds can play in initiating reforms that are sustained. The research was conducted by staff of the Center for Science Education at Education Development Center, Inc. (EDC), in Newton, Mass., in collaboration with staff at the Caltech Pre-College Science Initiative (CAPSI) in Pasadena, Calif. This research was supported by a grant from the National Science Foundation and was directed by Dr. Jeanne Rose Century at EDC and Dr. Jerome Pine at CAPSI.

The goal of this study was to identify and document factors in school systems that contribute to sustained educational change in science education. The purpose was to provide districts now engaged in improving their science education programs and districts that are considering doing so in the future with information to help them more strategically and effectively build an infrastructure for long-term improvement.

Specifically, this study focused on nine communities with K–6 science education programs begun from nearly 10 to 30 years ago. These communities differed in their sources of funding as well as the longevity of their programs. This study investigated how, and the extent to which, these communities have sustained their science education programs and the factors that have contributed to this sustainability.

Through on-site interviews and observations, surveys, case studies, and document analysis, the study investigated the districts' efforts in the following areas:

- Current status of the science program compared with initial goals
- System context and external conditions that have an impact on lasting change
- Strategies for achieving program goals and building district capacity to improve
- The influence of practitioner and system capacity on sustainability
- External funds as a catalyst for widespread, lasting reform

The findings of the research include nine descriptive site summaries and a cross-site report. The site summaries were designed primarily to provide the reader with a description of the origins, implementation, and evolution of each of the nine science programs. They also offer a brief analytic section that is designed to provide the reader with a bridge to the cross-site report. The cross-site report draws from all nine sites to identify common themes and recurring issues relevant to sustainability. It is primarily analytic while offering concrete supporting examples drawn from the nine sites. The cross-site report also includes a discussion of implications of the findings for funders, reformers, and practitioners.

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SUMMARY OF RESEARCH METHODOLOGY

Research Questions

The study was guided by the global research question: What factors contribute to or inhibit the sustainability of a districtwide hands-on science program? Within this broad question, the research focused on several sub-questions: (1) What is the current status of the science education program within the system and how does that compare with the initial goals and implementation of the program? (2) What conditions and contexts surrounding a science education reform effort impact the sustainability of the reform? (3) What decisions have practitioners made and what strategies have they used to bring about enduring change and build capacity for continuous growth? (4) How has the capacity of the practitioners in the system and the capacity of the system itself affected the sustainability of the reform? and (5) What is the role of external funds as a catalyst and/or support for lasting, widespread reform?

Research Design & Analysis

To answer these questions, the study utilized a multi-site case study methodology that made full use of primary and secondary data sources and accounted for the uniqueness of each community while allowing for cross-site generalizations. The primary data was gathered using qualitative approaches including semi-structured interviews, focus group interviews, observations, and document analysis. This data was supplemented with quantitative data collected through a survey administered to all principals and a random sample of 100 teachers at each site.

Some members of the research team had previous experience working with some sites. To alleviate bias, researchers gathered data in sites with which they had no prior interactions. Throughout the process of analyzing data, researchers were careful to address the potential of bias as a result of their experience with hands-on curriculum and any interactions with sites previous to this study.

Site Selection

The study focused on nine school districts[1] that have established an elementary science program reflecting the standards developed by the National Research Council and the American Association for the Advancement of Science. The districts fall into two main groups: those that began their science education reform efforts in the 1960s and early 1970s, and those that began their efforts from the mid-1980s into the 1990s. Four of the nine communities are in the former group. Of those four, two have had enduring science education programs and the other two had programs that were strong for a number of years, waned over time, and are currently in a process of renewal. These communities were of particular importance to the study as they shed light on the long-term development of science education programs and on how the "trajectories" of reform efforts vary over many years.

The remaining five communities fall into three sub-groups: Two had funds from the National Science Foundation that had been expended before the research began; one received funds from the National Science Foundation that were expended immediately prior to the beginning of the research; and two initiated their science reform efforts without significant external funding. Together, these districts represent a range of size and geographical location as well as years of participation in reform.

1 All district and individual names are pseudonyms.

Site Visits

Teams of two researchers made several site visits to each of the nine sites over two and one half years of data collection. Each site was visited at least three times with each visit lasting two to four days. In the initial phase of the research, researchers conducted "pre-visits" and phone interviews that enabled them to obtain an overview of the history of the site, discuss data collection procedures, and identify important issues and additional data sources/key individuals to interview. These pre-visits allowed researchers to construct a timeline of the science program, identify critical events in the life of the program, and identify major players both inside and outside the district. This initial contact also included discussions of logistical issues (e.g., timing for site visits), potential schools and classrooms to visit, and tentative scheduling of individuals to interview on-site.

Following the pre-visit, site visits typically consisted of interviews with key district personnel including the superintendent, assistant superintendent, assessment specialist, director of professional development, director of curriculum and instruction, budget manager, science coordinator, Title I and Federal Grants administrators, mathematics and language arts subject matter coordinators, technology program director, and special education director. In addition, researchers conducted teacher focus groups as well as interviews with key stakeholders, such as school board members, union representatives, and community members. Researchers also conducted a minimum of 20 observations of science instruction in at least 10 schools and conducted interviews with the teachers observed and their principals. Researchers also observed professional development sessions and reviewed documents on-site.

Interview and Observation Protocols[2]

Interview protocols were designed to gain information about the goals/vision of the district science program, actual classroom practice, professional development, support for teaching science, sustainability of the district science program, and other key critical issues that had an impact on the science program or the district. Interview protocols were adapted to the individual/group being interviewed. The interviews also explored the factors an individual thought contributed to sustainability of the science program, what factors supported or jeopardized the program, and what they envisioned for the future of the district's science program. Individuals were also given the opportunity to discuss any other issues that they thought were relevant that the interview had not explored.

Researchers conducted observations of science classes to gain a clearer understanding of the current status of the district science program. The objective of an observation was to obtain a "snapshot" of instruction, to contribute to a larger understanding of the school district's practices and goals, and to document the use of hands-on investigation and/or inquiry methods of teaching science. Researchers normally observed an entire science class in grades K–6 that varied in length from approximately 30 minutes to an hour depending on the lesson. Researchers used a semi-structured observation protocol to document the structure of the lesson and capture the teacher's instructional strategies.

Principal and Teacher Surveys

Researchers administered two surveys: the first to all principals in each of eight district sites and the second to a random sample of 100 teachers in each of the eight district sites[3]. The purpose of the surveys was to supplement the qualitative findings of the study by providing additional data on the current status of the program.

2 For a list of interviews and observations conducted at this site, see Appendix A.

3 One district, Montview, chose to abstain from participation in the survey.

These data may not accurately reflect actual districtwide practice. (For a summary of the survey data, see Appendix B.) Survey development followed a three-step process: (1) Researchers conducted a review of other similar instruments; (2) surveys were piloted and interviews were conducted with pilot participants; and (3) a survey expert reviewed the surveys and provided feedback so final revisions could be made.

The surveys provided corroboration of qualitative data and helped guide future qualitative data gathering. They were designed to answer the following questions: (1) What are the respondents' understandings of the current science program? (2) What importance do respondents place upon the science program and what priority does it get within the other areas? (3) What are the respondents doing to implement/support the science program? (4) What factors are important in sustaining an effective science program? The surveys included items about teacher/principal background and experience, school instructional practice, curriculum and materials, professional development, principal practice, teacher classroom practice, influences on science, support for science, and sustainability of science.

For more detailed information about the methodology of this project, please refer to the cross-site report.

OVERVIEW OF PROJECT SITES

	GLENWOOD*	LAKEVILLE	HUDSON††	MONTVIEW‡	BAYVIEW	GARDEN CITY	SYCAMORE	BENTON	BOLTON
SIZE									
Sq. Miles	47†	76	200	800	55	800	25	15	320
# elem. students	27,000	12,000	43,151	47,087	5,849	28,000	6,400	4,300	27,000
# elem. schools	77	23	50	92	23	52	30	15	60
# elem. classroom teachers	1,300	778	1,630	1,978	600	1,300	300	200	1,144
RESOURCES									
Per pupil expenditure	5,668	4,996	5,122	4,443	5,973	5,046	6,500	13,296	6,508
Teacher starting salary	$31,172	$35,573	$27,686	$25,832	$27,467	$27,718	$29,892	$34,116	$32,600
NSF funds?	yes	yes	yes	no	no	no	no	yes	yes
DEMOGRAPHICS									
% students eligible for free and reduced price lunch	66%	70%	41%	18%	40%	32%	65%	39%	30%
% white	13	17	68	85	57	69	69	41	62
% African American	18	34	3	1	12	28	12	34	9
% Hispanic	21	45	23	11	10	0	11	14	6
% Asian/Pacific Islander	27 (Chinese)	4	2	3	18	0	8	10	9
% Native American	21	0	4	0	3	0	0	0	13
% Other	0	0	0	0	0	3	0	1	1
OTHER INFORMATION									
Year program began	1989	1986	1974	1968	1966	1989	1988	1994	1977

* District names are pseudonyms.
† Figures are for years ranging from 1998–2000. During this time demographics and expenditures shifted and were calculated in a variety of ways.
†† The Hudson site report offers the reader an additional detailed description of a classroom science lesson.
‡ The Montview site report is unique in that it emphasizes the historical development of the program and the circumstances that influenced and shaped its evolution.

GARDEN CITY
EXECUTIVE SUMMARY

INTRODUCTION

The Garden City[1] science program is a sleeping giant. It has grown slowly and quietly over the past 13 years and, with little fanfare, it has developed into a districtwide program that is recognized and praised by teachers across the district. The gradual introduction of the program, along with subtle, strategic steps toward improvement, have helped it grow and develop with relatively little resistance and increased support. Now, the "low profile" that helped the program in the past may hamper its continued growth and development. While some of the basic elements of the program (materials center, kit materials, kit training) that operate within the confines of the science "department" are well established, continued growth and development may require program leaders and advocates to extend themselves beyond department boundaries (e.g., into accountability and professional development). These actions may increase attention given to the program, and such attention, in the context of the Garden City School District, can have both positive and negative consequences.

CONTEXT

Community Overview

The Garden City School District (GCSD), at nearly 800 square miles, is the largest district in its state. It includes the city (population 58,000) as well as the surrounding county, which has a population of 370,000. The district includes suburbs, smaller towns, and rural communities. First an agrarian community, then dominated by the textile industry, Garden City is now home to several multi-national corporations. The county has the 14th highest per capita income in the state, but it falls near the bottom for local tax effort support for schools. Its 2000 per pupil expenditure of $5,046 placed it at a rank of 82nd out of the state's 86 districts.

GCSD has a 12-member board, elected by region for four-year terms, and a large central office administration (with more than 100 central office administrators and nearly 200 support staff) that is cumbersome and confusing, even to those who are part of it. Together, they oversee GCSD's 51 elementary schools, which enroll 28,000 students. The student population is just over two-thirds white (69 percent) with the remaining third African American (28 percent) and others. Additionally, one-third of the student population is eligible for free or reduced price lunch.

1 Any individual, organization, or corporation named in this report has been given a pseudonym.

Issues of Local Importance

New Education Plan: To focus the community's energy and resources on a few important goals, a committee of 45 people drawn from a range of community and district groups was established to develop a new education plan. Completed in 1999 and called "Advancing To High Achievement: Garden City School District's Plan for Success" (ATHA), this plan articulates an "all students can learn" philosophy, sets goals and objectives for the students of GCSD, and assigns "performance measures" for achieving those goals. The one academic goal of the plan focuses on rigorous, high quality instruction, but does not explicitly mention science (though it does refer to reading and mathematics).

State Standards: In 1998, the state legislature passed the Corona Accountability Initiative, requiring core curriculum standards in every subject area. Science standards first came to the state in 1993 and have been revised several times since then (three versions in four years) due to various political influences and a change in the state leadership. The state has recently completed and accepted new science standards and is distributing them along with a promise not to change them again for the next several years.

New Superintendent: Following a transfer of leadership through seven superintendents since 1951, Garden City hired its current superintendent in April 2000. The new superintendent came to Garden City following a military career and two years as a high school principal. His appointment responded to community pressure to select a non-conventional person and to the board's interest in someone with business leadership experience.

PROGRAM HISTORY AND DEVELOPMENT

The evolution of Garden City's science program parallels the development of education reform in the state, which began with the passing of the Education Enhancement Act (EEA) in 1984. Previously, elementary science education in the district was practically nonexistent. Each class took one field trip per year and that, along with sporadic textbook instruction and a few idiosyncratic "hands-on" lessons, *was* the science program.

In the mid-to-late 1980s, the state took several steps that would influence the future kit-based science program. First, when the EEA passed, state educators required that standards for science be written and added to the already existing set of state educational standards. That same year, the state put a standardized test in place (known as the Corona Evaluation of Fundamental Skills or CEFS), which included science testing in grades 3, 6, and 8. Finally, in 1987, a penny sales tax was passed that was targeted to support science with the purpose of attracting business and industry to the state.

Nineteen eighty-nine marked the beginning of Garden City's current science program. The science coordinator at the time saw a flyer about an institute at the National Science Resources Center (NSRC) and decided to attend with an elementary school teacher and principal as part of her team. The institute included an opportunity to learn about the science program in Fairfax County, Va., as well as films and slide shows of other kit-based science programs in Anchorage, Alaska, and Multnomah County, Ore. According to the science coordinator, "The message was 'the kits,'" and they returned home eager to initiate their own program using the exemplary programs as models.

That year, the State Department of Education was offering "Target 2000" grants of $80,000 to support "innovation." The science coordinator applied for and won financial support to get their hands-on program started. They had proposed the development of a prototype science program with teacher guides and booklets that they would create and pilot in about one-fifth of the district. They were granted the money in January 1990, six months before they expected to receive it, and though they were not quite ready, they began their work.

In the spring of 1990, they continued their learning process by visiting two other "exemplary" sites—Mesa, Ariz., and Schaumburg, Ill. The science coordinator invited one of the area superintendents to accompany them, and he accepted the invitation. This was fortuitous for the science program, because he eventually became superintendent of the district. The team returned from their trip armed with new knowledge and, in the summer of 1990, set out to create their own materials. The science coordinator recruited three teachers from each grade level to write, and used Mesa's program as a model. The writers focused on creating grade-level units combining original ideas and materials from other sources that would last about nine weeks.

Once the kits were ready, the science coordinator introduced "Project Science Kit" in 7–10 schools, most of which were small Title I schools that had no more than one class per grade level. The trial process went on into 1992, and during this time the program solidified. Materials were housed in a single room of a building used for books and resource storage. The original NSRC team attended a Monsanto Science Symposium, this time bringing a different area superintendent with them. This superintendent was exposed to the National Science Foundation, heard the messages about the importance of science, and "totally bought in." She started pushing for the science program to get a part-time clerk and better space for materials at a central distribution center.

As the program developed, Fran Reece, the current science coordinator, was able to upgrade and expand the kits. She replaced some of the teacher-made materials with the now commercially available kits. Reece continued to press on and attend to the everyday needs of the program while trying

to stay on top of the changes in science standards and frameworks. The inclusion, exclusion, and then inclusion of science in the state's testing program left teachers anxious about their science instruction. Reece, aware of the importance of aligning the kits with the state standards and frameworks to prepare students for the state test, felt she was working with moving targets. The district hired an additional science consultant, so given Reece's investment in the elementary program, she opted to focus on the elementary and middle grades while leaving the secondary level for the new consultant. However, fiscal stresses soon reduced funding and the high school position was eliminated after one year.

The prolonged debate about science standards and frameworks has produced increased awareness about the importance and impact of these guidelines. Reece had been testing out new kits and making some adjustments in kit selection to accommodate the changes in the standards, which also contributed to teachers' awareness of them. With K–12 responsibility again, along with the completed frameworks, Reece has a sense that they finally can take some action knowing that there will be some consistency and stability of expectations at the state level.

THE CURRENT PROGRAM

Curriculum

The science program uses kits comprising locally developed and commercially available materials. Teachers are expected to teach three kits per year and are offered an optional fourth kit. Teachers had been expected to teach four kits per year until 1999–2000 when, in consultation with teachers, Reece decided that was "too much." All teachers are given a written curriculum packet for their grade levels. The packets (last revised in 1997) include a description of the hands-on activities in the kits, a short summary of the content, an alignment with the state standards and the standardized test, a list of the required concepts (of the state test) not covered by the curriculum, and process skills standards. Some of the packets have additional materials, such as sample assessment sheets, extension activities, and suggested performance-based assessments. The packets explain that "kits are the core of GCSD's science curriculum," but also offer suggestions for science instruction for teachers who don't have kits in their classrooms.

Materials Center

Reece has worked to ensure that Garden City has a materials center that can handle maintaining, distributing, and refurbishing the 1,350 kits they circulate for their 1,300 teachers. One part-time and two full-time staff people attend to this, and many teachers praised their ability to deliver the kits on time and produce kits with nothing missing. Many teachers attribute the sustainability of the program to the kits and the materials center.

Schools with Science Labs

Science labs, a component of most new schools, are an interesting aspect of elementary science in GCSD. Labs in the new buildings are attractive and inviting. Naturally lit with large windows, they feature lab benches, sinks, counters, storage areas, and equipment such as microscopes, computers, and televisions (anything else must be purchased by the individual school). Some older buildings have retrofitted labs in classrooms, and these also have equipment as well as counters, sinks, and additional storage areas. However, although a significant initial investment, labs are often inadequately supplied and staffed. The district does not provide enough funding to support a lab teacher or to purchase the necessary additional materials and equipment.

4-Blocks *Program*

Garden City is implementing a new language arts program known as "*4-Blocks*," which is greatly affecting the status of the science program. A central office mandate, *4-Blocks* reflects the administration's desire for a more cohesive reading program. They intended to introduce it gradually, but principals were so overwhelmingly enthusiastic, they decided to get everyone on board in the first year. The *4-Blocks* program requires that all students spend time in each of the four "blocks"—self-selected reading, writing, guided reading, phonics—every day, with some blocks requiring at least 45 minutes. Without careful coordination, this leaves little time for science instruction. Still, some teachers are finding creative ways to integrate science into *4-Blocks*.

Program Goals/Standards

The goals of the program at its inception were to try to create opportunities for students to use what the first science consultant called "science process skills." Today, the district does not have a formal statement of program goals. Reece hopes to formulate an articulated K–12 program that builds conceptually and that gives students an appreciation for science and an ability to use it. She wants kids to be prepared for college and a career and summarizes her intent by saying, "I want to have the best program in the region."

Instruction

The instruction in GCSD ranges from very teacher-directed to more student-led, with some features consistent across classrooms. In interviews, teachers expressed an appreciation for the difference between "hands-on" and "inquiry" science. One second grade teacher's description of the intent of the science program, to "give children more of an opportunity to explore and discover some things for themselves," was typical, as was a third grade teacher's statement that the goal of the program was to give "them more hands-on experience." Focus group attendees said that "hands-

on is too narrow—[it's] expanded to discovery," and they wanted to "get kids to make discoveries on their own, in contrast to traditional teaching." In addition, teachers discussed the importance of teamwork in the classroom: "Cooperative learning *and* good discussion goes on, sharing ideas."

Teachers also discussed the pressures they felt from reduced time for science, the upcoming state-mandated test (Corona Achievement Test or CAT) in science, and the inherent challenges of teaching hands-on science. Almost all teachers referred to the difficulty in finding time to teach science because of the emphasis on language arts—*4-Blocks* in particular—and math. Additionally, teachers referred to the need to prepare their students for the CAT in science. Finally, teachers are acutely aware of the challenges of classroom management skills needed to teach hands-on science.

Assessment

GCSD requires elementary students to be graded in all subjects, including science, but there is no consistent methodology used by teachers to assess their students' understanding of the concepts and skills presented in the science kits. Although some kits contain sample process skills assessments, these are used quite differently among teachers and not at all by many. The variation in use of science labs described earlier also suggests a range in methods used by lab teachers to determine how well students are mastering the material.

The CAT, the only districtwide test in use, examines language arts and math only. As a result, the only assessment tools available are those provided in the kits, and there is little support or training in their use. The expectation from the state's department of education is that a CAT for science is in the near future. Teachers and principals are anxious about its arrival, but its development has been delayed and its actual date of introduction is unknown.

Professional Development

GCSD requires that all teachers participate in a total of 30 hours of professional development each year, with 14 of those hours taking place at the school site. Schools use different processes to determine professional development offerings that will take place on-site, leaving science professional development vulnerable to the pressures of time. According to Reece, professional development is a "hodge-podge at best." The district's professional development office competes for time and resources with the teaching and learning divisions, and there has been little effort to coordinate their professional development work. While Reece has given great thought to ensuring that the materials center was accommodating the needs of the program, she has directed less attention to professional development. The only consistent professional development the program offers are voluntary orientations to each kit. These sessions are one and one half hours long and informally taught by two to three standout teachers at each grade level who

act as Reece's de facto leadership team. Nothing is offered specifically to new teachers, though the district does assign each one a mentor—a regular classroom teacher to provide assistance and advice.

Additional professional development is offered at the Statewide Systemic Initiative (SSI) support center and the Copper Beech Science Center. The SSI, which was "designed to build a statewide infrastructure for supporting mathematics and science," offers leadership programs in science and math curricula, resources for teachers to check out from their materials centers, family math and science training, and content courses that are co-funded by the district. The Copper Beech Science Center is an impressive 62-acre facility that is part of the school district and functions as a resource to the students and teachers of GCSD. It looks much like a science museum and features a planetarium, living history farm, life science lab, discovery and sea life rooms, state-of-the-art multimedia auditorium, chemistry/physics lab, and weather lab.

DECISION MAKING AND LEADERSHIP

District-Level Decisions

The executive board and the superintendent are the key decision makers in GCSD and can profoundly affect the science program. The membership of the board changes periodically as do members' perceptions of their roles. The new superintendent is unfamiliar with the program, and Reece is working hard to acquaint him with it. The importance of the superintendent's support was put succinctly by one of the SSI center staff when he said, "If [the superintendent] decides that science is a priority, the science program will grow. He can't cut the program because the local corporations support it, but he could decide that it's in good hands and disregard it," which would, in effect, cause it to stagnate.

School-Level Decisions

Decision making at the school level has a significant impact on sustainability of the science program. The principal is in the position to either promote or undervalue the instruction of science. GCSD principals' comments reflected the conflicting pressures they feel on this issue. A great majority of the principals who responded to the informal RSR questionnaire reported that they actively support teachers' science teaching. Interviews with principals, however, also clearly showed they feel pressure to focus on reading and math to improve student scores on the CAT. Their responsiveness to this pressure is evident in the frequency of their observations of math and reading classes, the emphasis on professional development in reading, and the attention to achievement from one year to the next. Science does not receive this level of attention from GCSD principals.

Program Leadership

Reece, who has been with the program for about 10 years, possesses skills and experience on a national level. She has several national committee appointments and connections to many nationally recognized leaders in science education, from which she derives most of her professional support. Reece has a very congenial relationship with the central office administrators and is quite well-known and liked throughout the district. She has a style that has helped her gain credibility and support from teacher leaders who are now an informal group that supports the program. They feel that she is accessible to teachers and visible in the schools. They explain that when she came to Garden City, she didn't try to take over the program; rather, she asked the teachers what they wanted from the program. Teachers attending focus groups also remarked that she is "one of the few curriculum consultants" who is accessible, and principals and teachers praise Reece for her commitment and her approachable manner.

RESOURCES AND SUPPORT

Funding

Funding for the science program is remarkable because of the steady support from the district over the years. Money from the general fund supports the overall program, and there is a separate budget line item for kit refurbishment and for staffing the materials center. Eisenhower funds have also been an important part of the program's budget.

In addition to program support, elementary schools get $100 each year to spend on science (middle schools get an additional $3,000 per year). Comparing the schools' science allocations to other subjects creates the impression (and perhaps a valid one) that there is little money for science. One elementary principal commented that he gets $12,000 per year for reading, $10,000 per year for mathematics, and only $100 per year for science. The assistant superintendent for teaching and learning confirmed that the amount provided by the district ($250,000–$300,000 per year) would need to double to "do the science program right." But even though it may not be sufficient, she asserted that it is more money than any other subject area receives.

Community and Partnerships

Partnerships abound in GCSD from small school/business arrangements (1,500 at last count) to more significant relationships with the SSI, Copper Beech Science Center, and several large corporations. The latter group of partnerships has the most important impact on the science program districtwide.

One such partnership is with SecCorp, a multinational corporation that came to Garden City in 1992. Corporate management soon expressed an interest in becoming involved with education at the state and district level. They wanted to develop positive public relations as well as support a high quality science program for employees' children and for its future workforce. Its support began with an "invest as you go" approach, funding individual events that were part of an overall initiative, and based future support on the success of the previous effort. As SecCorp's interest in a statewide impact was satisfied and as its own financial security improved, management has become interested in long-term support.

ACCOUNTABILITY

The CAT, first administered districtwide in 1999, focuses on English/language arts and mathematics only, and is used each year in grades 3–8. The state intends to include science on the CAT in the near future. Teachers believe that with CAT just around the corner, school personnel are now starting to pay attention to science and that more monitoring of science instruction will follow.

At the district level, Garden City continues to pursue its own accountability agenda through district staff and additional testing. The district administers a norm-referenced test called the MAT7, covering English/language arts in grades 2, 3, 8, and 10. Student scores are reported by school, released to the public, and highlighted in the local media. None of the schools, however, have a formal accountability system in place for science instruction or student learning in science. Informal mechanisms include occasional monitoring by dropping in on classes and teacher-principal meetings at the beginning and end of the year. In some schools, science instruction is not observed or assessed in any way. The only districtwide means of monitoring teachers' science instruction is to check the materials that are used from their kits, but that is not done systematically. One principal does ask teachers to demonstrate how they have covered science process skills and adds that his school did some training in that area this year. "The only way to know is to be in that classroom," he added.

EQUAL ACCESS TO SCIENCE

The governmental affairs coordinator—a lobbyist for the district—believes that "inequity is the biggest problem in the state." The new superintendent raised the issue of equity and achievement gaps only months into his tenure. He noted the obvious and significant difference in SAT scores between African-American students and white students, and alerted his area superintendents and principals to his desire to close the gap. A reporter from the city's daily newspaper as well as several teachers and principals also

noted that schools in more affluent areas have more resources. The affluent schools have more white students, and their parents seem to be able to get their concerns heard by the school administration. One teacher explained that these differences cause resentment between schools.

This disparity reveals itself acutely in the use and maintenance of science labs. Science labs can only function when a school can raise money to pay for supplies. Some students have no access to their labs at all, while other labs are staffed and elaborately fitted with additional equipment and materials. In several schools, the PTA had not only equipped the science lab, but also created computer labs, and several built outdoor gardens for pleasure and for use in science.

SUMMARY

The science program in Garden City has survived for many reasons. It has built a strong and stable reputation in the district and in the extended community, and its leaders have been passionate and committed advocates who sought the best curriculum materials available, continually attended to their improvement, and established a reliable and high quality system for managing them. The program's leaders have done all of this at a pace and style consistent with the district's culture. The program is considered to belong to the district and is supported by it. These attributes did not accrue over night but have required leaders' steady and strong effort over time.

Garden City now is at what seems to be a critical juncture. Moving out of its time of quiet steady growth, Reece is trying to progress it past its "middle age" and into a phase of greater maturity. At the same time the district, like the rest of the country, is experiencing significant pressure to account for students' achievement in English/language arts and math. A new superintendent has entered the district. The state is on the brink of introducing a new standardized test in science. All of these changes combine to create a sense of upheaval and raise the question of whether this is a time to try simply to survive or to press on for the science program's continued growth.

GARDEN CITY

INTRODUCTION

The Garden City[1] science program is a sleeping giant. It has grown slowly and quietly over the past 13 years and, with little fanfare, it has developed into a districtwide program that is recognized and praised by teachers across the district. The gradual introduction of the program, along with subtle, strategic steps toward improvement have helped the program grow and develop with relatively little resistance and increased support. Now, the "low profile" that helped the program in the past may hamper its continued growth and development. While some of the basic elements of the program (materials center, kit materials, kit training) that operate within the confines of the science "department" are well established, continued growth and development may require program leaders and advocates to extend themselves beyond department boundaries (e.g., into accountability and professional development). These actions may increase attention given to the program and such attention, in the context of the Garden City School District, can have both positive and negative consequences.

SUSTAINABILITY: THE ABILITY OF A PROGRAM TO MAINTAIN ITS CORE BELIEFS AND VALUES AND USE THEM TO GUIDE PROGRAM ADAPTATIONS TO CHANGES AND PRESSURES OVER TIME.

CONTEXT

Community Overview

The Garden City School District (GCSD) is the largest district in its state. It includes the city (population 58,000) as well as the surrounding county, which has a population of 370,000 people. The district includes suburbs, smaller towns, and rural communities.

The district has restructured itself several times in the past 50 years. It was consolidated in 1951 when 82 local school districts merged. In the late 1960s, the district was officially desegregated and divided into five subareas. These were consolidated to four in the late 1970s, each with its own area superintendent. The sub-districts continued to consider themselves as four distinct parts rather than as parts of a single whole, and in the early 1990s, the superintendent united GCSD, merging the areas into one, removing the area superintendents, and having all principals report directly to him. Still, a strong spirit of independence remains among many of the district's 51 elementary schools as well as a sense of competition and lack of trust between formerly separate areas. In an October 2000 interview, one area superintendent noted that the district is "just now outgrowing the impact of the 1950s independence." Periodically, those who feel that the

1 Any individual, organization, or corporation named in this report has been given a pseudonym.

SIZE	
Sq. miles	800
# elem. students	28,000
# elem. schools	51
# elem. classroom teachers	1,300
RESOURCES	
Per pupil expenditure	$5,046
Teacher starting salary	$27,718
NSF funds?	no
DEMOGRAPHICS	
% students eligible for free/reduced price lunch	32%
% white	69
% African American	28
% Hispanic	0
% Asian/Pacific Islander	0
% Native American	0
% Other	3
YEAR CURRENT PROGRAM BEGAN	1989

Figures are for years ranging from 1998–2000. During this time demographics and expenditures shifted and were calculated in a variety of ways.

"urban people don't understand what the mountain people feel" have attempted unsuccessfully to have the district broken up into five or six smaller independent entities.

Garden City's economy expanded dramatically throughout the 20th century. First an agrarian community, then dominated by the textile industry, Garden City is now home to several multi-national corporations whose employees have higher incomes and different expectations for their children's education and future employment. The school system responded to the rapid growth by building new schools—12 high schools in the last seven years—and trying to improve the educational program.

The strong industrial and business presence in the county plays an important role in GCSD. The Chamber of Commerce played a key role in raising the standards and recently formed the Task Force for Educational Improvement (TFEI), which focuses on non-instructional issues and provides supplementary support for GCSD. The TFEI provides small grants to teachers, offers scholarships for national teacher certification, and engages in education-related community issues (e.g., a survey of teacher quality and support for candidates for school board). One of the founders of the TFEI (who also served on the school board during the 1960s) described the business community as "the power structure" of the county. The school board has been receptive to this type and level of assistance.

Most citizens of Garden City seem to be suspicious of government involvement in local affairs. They generally are politically conservative and against increased taxation. The county has the 14th highest per capita income in the state, but it falls near the bottom for local tax effort support for schools. Its 2000 per pupil expenditure of $5,046 placed it at a rank of 82nd out of the state's 86 districts. Overall, Garden City taxpayers are reluctant to provide additional financial support to the schools.

Garden City has a large central office administration (more than 100 central office administrators with nearly 200 support staff) that is cumbersome and confusing, even to those who are part of it. The organizational chart is more than 20 pages long and shows Fran Reece, the science "consultant" (Garden City's term for a curriculum coordinator) as one of at least 20 people directly supervised by the assistant superintendent for curriculum and instruction. While GCSD has many committees and a politically astute staff, genuine collaboration is a rare commodity. Offices and staffs tend to be protective of their turf, and the districtwide sense of independence often impedes interaction between departments and schools.

The Garden City Executive Board, a 12-member board elected by region for four-year terms, oversees the school district. Election battles for school board seats are heated and sometimes bitter, often pitting the conservative (and sometimes religious) factions against the liberal groups. Some community members believe that members sometimes advocate for their own

electoral regions instead of doing what is best for the whole district. Past boards have been described as "micromanaging," but membership has recently changed, and at least one central office administrator said that the current board is more knowledgeable and interested in curriculum and instruction than previous boards. "They're smart. Their goals are the goals of our district plan."

Issues of Local Importance

New Education Plan: To focus the community's energy and resources on a few important goals, a committee of 45 people drawn from a range of community and district groups was established to develop a new education plan. Completed in 1999 and called "Advancing To High Achievement: Garden City School District's Plan for Success" (ATHA), this plan garnered much public attention. It articulates an "all students can learn" philosophy, sets goals and objectives for the students of GCSD, and assigns "performance measures" for achieving those goals.

Only one of the five goals is related to academics, while the others are related to facilities, environment, and the community. The academic goal focuses on rigorous, high quality instruction, but does not explicitly mention science (though it does refer to reading and mathematics). The special assistant to the superintendent (who headed the development and implementation of ATHA) was optimistic that the plan presents opportunities for science, but acknowledges that science could slip through the cracks. However, one school board member noted that just because the plan doesn't mention science doesn't mean it represents a threat to the science program. Rather, she explained, they are merely focusing on reading and mathematics first—then they will focus on social studies and science.

State Standards: In 1998, the state legislature passed the Corona Accountability Initiative, requiring core curriculum standards in every subject area. Science standards first came to the state in 1993 and have been revised several times since then (three versions in four years) due to various political influences and a change in the state leadership. The state has recently completed and accepted new science standards and is distributing them along with a promise not to change them again for the next several years.

New Superintendent: Following a transfer of leadership through seven superintendents since 1951, Garden City hired its current superintendent in April 2000. Following a superintendent who had a long history in Garden City, the new superintendent came to Garden City following a military career and two years as a high school principal. His appointment responded to community pressure to select a non-conventional person and to the board's interest in someone with business leadership experience.

The fall after he was hired, there were both anxiety and enthusiasm for the changes the superintendent wanted to bring to the district. It was already clear that his style was very different from that of his predecessor. Fran Reece, the science coordinator, reported that her access was diminished and

that getting access to him was difficult. Any communication had to pass through several gatekeepers before reaching the superintendent directly. For example, Reece had requested a meeting with him and still had not received a reply two and a half weeks later. By October of 2000 the superintendent had already reorganized the district's structure and eliminated many positions. He re-divided the district into the old four sub-districts and principals again reported to an area assistant superintendent.

PROGRAM HISTORY AND DEVELOPMENT[2]

The evolution of Garden City's science program parallels the development of education reform in the state, which began with the passing of the Education Enhancement Act (EEA) in 1984. Previously, elementary science education in the district was practically nonexistent except for what took place at the Copper Beech Science Center (described later in this report). One teacher explained that "you stuck to the book pretty much and there wasn't too much else offered." Each class took one field trip per year to Copper Beech Science Center and that, along with sporadic textbook instruction and a few idiosyncratic "hands-on" lessons, was the science program.

Sporadic textbook instruction and a few idiosyncratic "hands-on" lessons, was the science program.

In the mid-to-late 1980s, the state took several steps that would influence the future kit-based science program. First, when the EEA passed, state educators required that standards for science be written and added to the already existing set of state educational standards. That same year, the state put a standardized test in place (known as the Corona Evaluation of Fundamental Skills or CEFS) that included science testing in grades 3, 6, and 8. Finally, in 1987, a penny sales tax was passed that was targeted to support science with the purpose of attracting business and industry to the state.

Two years later (1989) marked the beginning of Garden City's current science program. The science coordinator at the time (Reece's predecessor) saw a flyer about an institute at the National Science Resources Center and decided to attend with an elementary school teacher and principal as part of her team. The institute included an opportunity to learn about the science program in Fairfax County, Va., as well as films and slide shows of other kit-based science programs in Anchorage, Alaska and Multnomah County, Ore. According to the science coordinator, "the message was 'the kits'" and they returned home eager to initiate their own program using the exemplary programs as models.

That year, the State Department of Education was offering "Target 2000" grants of $80,000 to support "innovation." The science coordinator applied for and won financial support to get their hands-on program started. They

2 For a timeline of this site's history, see Appendix C.

had proposed the development of a prototype science program with teacher guides and booklets that they would create and pilot in about one-fifth of the district. They were granted the money in January 1990, six months before they expected to receive it, and though they were not quite ready, they began their work.

In the spring of 1990, they continued their learning process by visiting two other "exemplary" sites—Mesa, Ariz., and Schaumburg, Ill. The science coordinator invited one of the area superintendents to accompany them and he accepted the invitation. This was fortuitous for the science program, because he eventually became superintendent of the district. Looking back, he recalls being "taken" with what he saw. "I came back from that trip and then it made a lot more sense to teach science through the kit program than what we were doing in many instances." In retrospect, the science coordinator now sees that invitation as "a stroke of genius, the best thing we did. Having him on the team was key." Through this experience, the science leaders built a trusting relationship with the future leader of the district.

The science leaders built a trusting relationship with the future leader of the district.

The team returned from their trip armed with new knowledge and in the summer of 1990, set out to create their own materials. The science coordinator recruited three teachers from each grade level to write, and used Mesa's program as a model. The writers focused on creating grade-level units that were a combination of original ideas and materials from other sources that would last about nine weeks. According to one writer, "We just started pulling activities and anything that we could get our hands on that would help us teach the concepts…for each unit of study." Another writer recalled that the kits were technically not inquiry-based, but rather "activities that we can use to help us teach this particular fact or this particular understanding."

Several team members recalled a somewhat haphazard process of topic selection. The coordinator laments that she didn't have the forethought to determine a "scope and sequence." One of the original writers remembered that they chose topics by looking at textbooks and identifying the themes that already were being taught at that grade level. One recalled that they rationalized this approach by saying, "It won't be a total shock if we try to go with the kinds of topics that are in the book."

There seems to be consensus that "developing the materials was an ordeal," but there wasn't much they could purchase at the time. Still, an unexpected but positive outcome of this process was that many members of the team developed a reputation among their colleagues as being leaders in science education. Their credibility would help the program later on.

Many members of the team developed a reputation among their colleagues as being leaders in science education.

Before the science coordinator could introduce the units to the schools, she had another hurdle to cross. When writing the teacher guides, the team hadn't considered the practical issues entailed in identifying, purchasing, and collecting all of the materials that the teachers would need. The coordina-

tor, the original NSRC team and a parent volunteer went through the written units and generated shopping lists. They "filled two buggies full of stuff at Wal-Mart" and then worked together to organize and pack them into kits.

Once the kits were ready, the science coordinator introduced "Project Science Kit" in 7–10 schools, most of which were small Title I schools that had no more than one class per grade level. One principal (who was part of the team) describes her school as "a bastion of traditionalism" but says the teachers began to buy in as they started to gather some "soft data" that supported the program. She speculates that this was perhaps an important boost for the program since a couple of her teachers had "powerful relationships with school board members."

The trial process went on into 1992, and during this time the program solidified. They housed the materials in a single room of a building used for books and resource storage. The original NSRC team attended a Monsanto Science Symposium, this time bringing a different area superintendent with them. This superintendent was exposed to the National Science Foundation, heard the messages about the importance of science and "totally bought in." She started pushing for the science program to get a part-time clerk and better space for materials at a central distribution center.

No one overtly opposed the program—although some resisted.

As the central administrators' understanding and appreciation of the science program deepened, teachers' opinions varied. No one overtly opposed the program—although some resisted. Others thought the whole approach was a good idea, that is, if they wanted to do science. But, through the determination of the first science coordinator and then Reece, the program put down its roots. The team's strategy was to focus on building support among the positive teachers, inviting them to workshops, and by speaking at principals' meetings in the four district areas.

In the spring of 1992, the program continued to solidify. The team developed and field-tested more kits, and the superintendent agreed to fund a clerk who could refurbish them. The science coordinator also obtained a local grant to expand the curriculum and finished the curriculum writing. All teachers received teacher guides for the units, but their number of kits was limited. Funds for refurbishment ($14,400) of the kits they did have were included in the district budget, and that line item has remained ever since.

Over the summer and throughout the following school year (1992–1993), one event after another buffeted the program. First, the original science coordinator took a university teaching position in August, and Fran Reece took over the position, leaving her position at the State Department of Education. Upon her arrival, she began learning about the kit program and found that there had been little professional development for teachers. Reece targeted her Eisenhower money (about $37,500 for K–12) that year for professional development and to buy additional materials for training. Second, the district went through an administrative "shake-up." Although

the superintendent remained, new deputy superintendents were named, and one of them was the area superintendent who attended the Monsanto Science Symposium. Third, the superintendent, the assistant superintendent, and the former science coordinator cultivated the support of a large corporation in the district, which donated $25,000 for the purchase of 48 kits (two of each of the 24 topics) that were shared across the 18 schools in one of the district's quadrants.

Of less direct impact, but still important overall, was a shift in membership of the school board. "Christian fundamentalists took over," according to a community member, and the political environment shifted. At the same time, the state released the "frameworks for learning," which were process-oriented and emphasized group work and critical-thinking skills. Not surprisingly, a heated debate ensued about the substance of these frameworks. The process to revise them, also fraught with controversy, began immediately; and after more than seven years, it ended in 1999–2000, when the third version of the frameworks was completed.

As the program developed, Reece was able to upgrade and expand the kits. She replaced some of the teacher-made materials with the now commercially available kits. Then in 1993, when working on the 1994–1995 school year budget, the board asked Reece if it needed to commit money to support the kit program. Reece suspects this unusual inquiry emerged from the work of the Task Force for Educational Improvement (TFEI). The TFEI, which awarded small grants to teachers, found they were getting many requests for science materials and noted that these requests coincided with new statewide testing in science. When TFEI informed the school board that there was a shortage of science materials in the classrooms, the board put $45,000 in the budget in what Reece understood to be a one-time support.

Along with funding the improvement of the kits, the board and the central office "upped the ante" for the science program's expansion. The area superintendent, who had been so supportive of their work, had by this time become the new deputy superintendent for teaching and learning (and Reece's boss). Instead of bringing on another group of 10 schools as planned, she decided the science program should immediately expand districtwide to include all 54 schools in the kit program. So, the program saw a trade-off. Instead of providing all grades with science materials in a selection of schools, they decided to provide kits for only the third-grade level but for all schools in the district.

Along with funding the improvement of the kits, the board and the central office "upped the ante" for the science program's expansion.

The next two years (1994–1995 and 1995–1996) brought a new superintendent to the district, more shake ups in the central office, and a continuing influential role for the school board. With the arrival of the new superintendent, the two area and deputy superintendents who had been so supportive of the science program were left in their positions but had all their authority removed. Thus, their ability to advocate for the program was drastically diminished.

The board once again asked Reece if she needed money for the science kits, and again, Reece was perplexed by the surge of interest in the science program. She speculated that teachers might have complained about needing kits or that parents had inquired about the program. Reece proposed $110,000 for kit refurbishment, assuming they would replace the $45,000 item with the $110,000. Instead, they left the $45,000 line in, added the $110,000, and both lines have been in the budget ever since. The additional funding enabled Reece to, among other things, hire two part-time clerks for the materials center and take responsibility for half of the district courier's salary.

During this year, an "adoption" year for science, the district's teachers would make a critical choice—science kits or textbooks—for their classrooms. *FOSS* science kits, already part of the district's curriculum, were included on the state's adoption list along with textbooks, meaning they could be purchased at lower cost than buying them off-cycle. However, instead of purchasing more kits, GCSD teachers decided to select a textbook to go along with the kits they already had. They made this decision for two reasons. The first was to respond to previous backlash over an earlier selection of a "progressive" math book, and the second was to be economical—the district was paying for kits, so there was no need to use the adoption dollars that way.

Instead of purchasing more kits, GCSD teachers decided to select a textbook—the district was paying for kits, so there was no need to use the adoption dollars that way.

Along with the budget and curriculum, Reece attended to her own professional development needs and to maintaining knowledge of and support for the program. She participated in the development of the NRC teaching standards and learned more about leading science programs by going to Mesa, Ariz., for the first NEXT STEPS conference and to Pasadena, Calif., to see their program. She also attended the second NEXT STEPS conference, bringing her boss, the deputy superintendent for teaching and learning, with her.

In 1997, the state began to focus on accountability and testing, as had so many states throughout the nation. The state's department of education established achievement standards and began testing a new assessment program. Accountability legislation passed, which included the issuance of report cards for schools based on their test scores. In addition, the new tests were "high stakes," meaning that the state could take over a school that consistently performed poorly.

Against this backdrop, the district's decision-making structure moved toward site-based management. According to the language arts coordinator, "They said to principals, 'you are the instructional leader in the building.'" Reflecting this shift in leadership and decision-making power, the title of the subject matter leaders changed from "coordinator" to "consultant." Reece's role appeared to have changed from subject matter expert/leader to the more ambiguous role of advisor. Still, the science program was still growing, and Reece asked for four teacher leaders to assist. She needed support from the principals to win approval from the superintendent but, due to the shifting district context, they were reluctant to advocate for her request at the time. Her request was denied and she hasn't asked again.

Later upheavals at the state level reverberated in the district. In 1998, the state elected a new governor and a new school superintendent. At the same time, a second version of the state science frameworks was released and the state removed science from its assessment program. In 1999, the department of education released the third (and according to them, the last) version of the state science frameworks, coinciding with the readmission of science to the new state standardized test program.

Reece continued to press on and attend to the everyday needs of the program while trying to stay on top of the changes in science standards and frameworks. The inclusion, exclusion, and then inclusion of science in the state's testing program left teachers anxious about their science instruction. Reece, aware of the importance of aligning the kits with the state standards and frameworks to prepare students for the state test, felt she was working with moving targets. The district hired an additional science consultant, and, given her investment in the elementary program, Reece opted to focus on the elementary and middle grades while leaving the secondary level for the new consultant. However, fiscal stresses soon reduced funding and the high school position was eliminated after one year.

The inclusion, exclusion, and then inclusion of science in the state's testing program left teachers anxious about their science instruction.

The prolonged debate about science standards and frameworks has produced increased awareness about the importance and impact of these guidelines. Reece had been testing out new kits and making some adjustments in kit selection to accommodate the changes in the standards, which also contributed to teachers' awareness of them. With K–12 responsibility again, along with the completed frameworks, Reece has a sense that they finally can take some action knowing that there will be some consistency and stability of expectations at the state level.

THE CURRENT PROGRAM

Curriculum[3]

The science program uses kits comprising locally developed and commercially available materials. Teachers are expected to teach three kits per year and are offered an optional fourth kit. Teachers had been expected to teach four kits per year until 1999–2000 when, in consultation with teachers, Reece decided that was "too much." Teachers recognize the importance of responding to the new standards, and one of Reece's current objectives is to align the kits more closely with those standards. A task force has been put in place to accomplish this.

All teachers are given a written curriculum packet for their grade levels. The packets (last revised in 1997) include a description of the hands-on activities in the kits, a short summary of the content, an alignment with the state

3 For an overview of the curriculum units used at this site, see Appendix D.

"Kits are the core of GCSD's science curriculum."

standards and the standardized test[4], a list of the required concepts (of the state test) not covered by the curriculum, and process skills standards. Some of the packets have additional materials, such as sample assessment sheets, extension activities, and suggested performance-based assessments. The packets explain that "kits are the core of GCSD's science curriculum," but also offer suggestions for science instruction for teachers who don't have kits in their classrooms.

While teachers understand that the kits are the curriculum for the science program, level of understanding varies of the relationship between kits and textbooks. One teacher commented that he doesn't "use the text much—mostly as a supplement," and other teachers are unsure how their principals and the central office expect them to combine the two. One novice teacher explained that "most of the program is based on kits" but that they also have a book even though "the book doesn't match well with the kits." Still another teacher alternates the kits with the text and "uses the text (as well as other supplements) to introduce activities." This lack of clarity about the relationship between textbooks and kits gave one first-year teacher the vague sense that "We're gearing everything to the bins [kits]." Later he explained that he would "like to see a decision made between using the 'buckets' [kits] or the text."

Although some teachers have minor complaints, many teachers are very grateful to have use of the kits and that they are delivered and refurbished for them. Kit distribution is determined on a master schedule at the materials center, and organized so that each grade level in each school is using the same kit at the same time. Information about the schedule is sometimes imperfect, and one teacher explained, "I never knew what kit I'd get" while a new teacher reported that she never got a schedule for her kits. The master schedule facilitates sharing among classes, but teachers noted its disadvantages, such as topics scheduled during unseasonable times (e.g., plants in the winter), or topics not being well timed with the administration of the standardized tests (teaching topics covered in the test after the test had been administered).

Teachers who have been in the district since the beginning of the program said they appreciated the improvement of the kits over the years. Rather than being committed to the familiar, homegrown kits as one might expect, one teacher commented that the "kits we purchase are much better," noting that they "are more user-friendly" and have a particular sequence, building one concept upon the next, in contrast to the homegrown kits that were a hodge-podge of activities.

Use of kits varies widely. Some teachers pick and choose activities from the kits, but many say they use the whole kit, start to finish. Other teachers

4 This refers to the science test administered by the state prior to the CAT. The science component of the CAT is still not in place as this report goes to press.

report that their use depends on how much time they have (see the discussion of the *4-Blocks* program below). However, the research project's survey showed that nearly two-thirds of the respondents selected parts of the kits to teach rather than teaching them from start to finish or from the start until they ran out of time. An evaluation form accompanies the kits, asking for teachers' feedback, but teachers do not always complete them. Like other leaders of kit-based programs, Reece has meager tools to assess the actual degree to which the kits are taught.

Materials Center

Reece has worked to ensure that Garden City has a materials center that can handle maintaining, distributing, and refurbishing the 1,350 kits they circulate for their 1,300 teachers. One part-time and two full-time staff people attend to this, and many teachers praised their ability to deliver the kits on time and produce kits with nothing missing. Many teachers attribute the sustainability of the program to the kits and the materials center. One teacher commented that elementary teachers have no time and the kits keep people from having to spend their own money on materials.

Still, Reece believes the program is in a "mid-life crisis" and thinks some teachers take it for granted. A science specialist for the SSI center (described further below) echoed this opinion, saying the "public and the teachers don't realize how lucky they are." As the program has grown and become accepted, there is little discussion among teachers and others of how to improve it or push it to the next level. There is little evidence of any questioning of the program or interest in pursuing professional development. Instead, there is a high degree of satisfaction with the status quo.

The program is in a "mid-life crisis" and some teachers take it for granted.

Principals' Perspectives

Most principals are knowledgeable about the science program and appreciated the value of hands-on science in general. "The days of reading a textbook and taking a test are over!" said one principal. Another commented that the kits are "better than reading about science. Kids retain lessons and they accommodate different learning styles. Every kid experiences success, they learn, it's fun, they're all successful, and it boosts their confidence." A third principal observed that hands-on science "helps the students relate it to real life."

The assistant superintendent for teaching and learning emphasized that principals' top concern was "ensuring that teachers understand what it means to teach to the standards." Many principals did, in fact, comment on the need to update the kits so that they meet the science standards. They believe there are gaps and when that is the case, "teachers use other resources [most commonly textbooks] to make sure they've covered all the standards."

Schools with Science Labs

Science labs, a component of most new schools, are an interesting aspect of elementary science in GCSD. RSR researchers visited 15 elementary schools, 12 of them with labs. Labs in the new buildings are attractive and inviting. Naturally lit with large windows, they feature lab benches, sinks, counters, storage areas, and equipment such as microscopes, computers, and televisions (anything else must be purchased by the individual school). Some older buildings have retrofitted labs in classrooms, and these also have equipment as well as counters, sinks, and additional storage areas.

The labs were intended to facilitate the use of kits in classrooms but, in fact, there is a great deal of variation in use. Although a significant initial investment, labs are often inadequately supplied and staffed. The district does not provide enough funding to support a lab teacher or to purchase the necessary additional materials and equipment. Some principals staff their labs by reducing the number of classes at a grade (thus increasing class size) and using that "found" position as a lab teacher. Others raise additional funds through their PTAs. One principal did not staff the lab with a teacher, but rather, with an aide who assisted classroom teachers with set-up and clean-up. In yet another school, a grade level organized a team schedule so that one teacher used the lab to teach science to all of the students in that grade level. "It is excellent and I really feel that it is what is needed, to have a lab situation where you have a teacher that really, really loves science.... While I'm doing that, there are other teachers who are teaching health and social studies." Still, many principals are not able to procure additional funding or implement these more creative arrangements. One principal rotates classrooms through the science lab and follows up with teachers who did not maintain their schedule of lab visits. But in other cases, the labs remain essentially unused.

The relationship between the science taught in the labs and that in the kit program also varies. One lab teacher explained that she doesn't work out of the kits because "those are for teachers." Another lab teacher uses the state science standards to guide his curriculum, saying that his school colleagues relied on him to give their students science instruction that met all of the standards. A third lab teacher tries to use her class time to supplement the kit program, while classroom teachers in another school use their kits in the lab and do follow up activities in the classroom.

In spite of the different ways they are used, science labs are highly visible and the variations in their funding have raised some equity concerns among administrators. Some schools cannot raise as much money as needed, while others can raise significant funds to staff and stock a science lab and a computer lab. One principal commented that the parents like to hear that their students are going to "the lab" and, as a result, those schools that don't have labs want them, while those that have them aren't necessarily sure how to use them.

The origin of the commitment to building labs into the elementary schools is unclear. They were first discussed in the early 1990s, and were included in the strategic plan for GCSD at that time. According to the science consultant, very little came of the plan, but a few schools added labs during renovations. Since then, however, labs have been integrated into building plans for all new elementary schools, but strangely, no one can recall why; the reasons have been lost to history.

Reece believes that labs are a threat to the science program as they create a setting that allows teachers to defer science instruction to a "specialist" who has no ties to the kit program. Furthermore, lab teachers don't coordinate their work with Reece as a matter of course, so her ability to know what science they are teaching is impaired. As she explains, "Everybody is so excited about these science labs, which the national standards say not to do in elementary school...I have had several conversations...to change some minds about it...because they were put in the plan back before they had the science kit program...."

Labs are a threat to the science program as they create a setting that allows teachers to defer science instruction to a "specialist" who has no ties to the kit program.

4-Blocks *Program*

Garden City is implementing a new language arts program known as *4-Blocks*, which is greatly affecting the status of the science program. A central office mandate, *4-Blocks* reflects the administration's desire for a more cohesive reading program. They intended to introduce it gradually, but principals were so overwhelmingly enthusiastic, they decided to get everyone on board in the first year.

Currently the amount of time necessary to implement *4-Blocks* means that less time and fewer resources go to science. The *4-Blocks* program requires that all students spend time in each of the four "blocks"—self-selected reading, writing, guided reading, phonics—every day, with some blocks requiring at least 45 minutes. Without careful coordination, this leaves little time for science instruction. "At [my] school, because of *4-Blocks*, a lot of people don't even teach science," said one teacher. There has been "so much emphasis on *4-Blocks* and reading that everything [else] has gone by the wayside," said another. Nearly all teachers felt that the district has put science and social studies on the back burner.

Without careful coordination, this leaves little time for science instruction.

Still, some teachers are finding creative ways to integrate science into *4-Blocks*. One teacher gives students reading materials that link to the science units, so that when they do their silent reading component, they can learn about science. "Integration is the key," said one principal. "Without it, there simply would not be enough time to teach everything," he said, adding that curriculum coordination at the district level is essential. "They have to work together to make it happen."

Program Goals/Standards

At the beginning of the program, the goals of the program were to try to create opportunities for students to use what the first science consultant

called "science process skills." "That was before we called it 'inquiry' or 'discovery learning,'" she said, explaining that they wanted kids "to use skills scientists use and to think and discuss the way scientists do." They wanted to provide materials so teachers wouldn't be overwhelmed. The principal who was part of the original NSRC team said that the goals also included increasing student achievement, increasing student interest in science, and closing the gender gap.

Today, the district does not have a formal statement of program goals. Reece explained, "We should have something we all believe in that is articulated…but in actuality none of that works around here." Still, she knows "we need something for people to hang on to." Reece hopes to formulate an articulated K–12 program that builds conceptually and that gives students an appreciation for science and an ability to use it. She wants kids to be prepared for college and a career and summarizes her intent by saying, "I want to have the best program in the region."

The major influence on the science program and its goals is the state's curriculum standards. Most teachers understand the standards to be, as one teacher put it, "a blueprint" that they are responsible to follow. Another teacher commented, "It's not that we're teaching to the test, but we have a responsibility to address the standards." In spite of widespread frustration with the process for determining the standards, and the numerous changes, most in the district accept them willingly.

"It's not that we're teaching to the test, but we have a responsibility to address the standards."

The district's science standards were developed from the *National Science Education Standards*.[5] They are organized by grade level, into the categories of inquiry, life science, Earth science, and physical science. The inquiry section is broken down into "process skills" and "planning and conducting investigations." Even without a written goal statement, teachers' and administrators' description of the goals of the science program feature process and problem-solving skills as a major theme. One teacher commented that the program is trying to help students attain basic skills in science and develop an understanding that "science is naturally fun." A number of people suggested that the goal was to teach process, thinking, or problem-solving skills, with "inquiry" and "process skills" used interchangeably. An experienced teacher who had been with the program from the beginning explained that inquiry was "giving children more of an opportunity to explore and discover some things for themselves... to say, here are the materials and this is what I want you to find out, and how can you do that?" In contrast, another teacher who had contributed to the development of the first kits explained that "elementary teachers don't have materials, and a materials center is the most cost effective way to provide good science for

5 National Research Council. (1996). Washington, DC: National Academy Press.

every kid every day." Others state the program goals in terms of bringing up scores on the standardized test or referring to the state standards.

In the central office, the deputy superintendent's description of the science program goals was quite broad. She explained that they wanted to help students understand science as "more than just reading about something....We want our children to know and be able to do science.... It is one thing to be able to read about it and remember the answers; it is another thing to be able to try to find out the unknown by going through a scientific process."

Looking to the Future

Reece's ideas have developed in the years she's been in Garden City and she aims to continue to improve the program. She plans to look carefully at the materials and the standards to determine what can best be done with an in-depth, hands-on approach and what topics should be covered with supplemental materials. "I have been able to change the program along the way," she said. "My other challenges for the curriculum itself are to develop the understanding of inquiry to actually move our teachers beyond the box, beyond the science kit, and go on and do more explorations."

Even though Reece states that she wants teachers to see the difference between what she understands as "hands-on" and "inquiry," she is uncertain about how much of the program needs to be inquiry for it to be a "good" program. With the high stakes assessments in mind, she wants to determine what areas of science can be taught using in-depth investigation and what areas are best covered with other approaches because "there is too much content." She feels that the program is "light years" from where she wants it to be, but feels she is taking steps in the right direction.

She is uncertain about how much of the program needs to be inquiry for it to be a "good" program.

Instruction

Two researchers observed eight classrooms in seven schools[6] (representing 14 percent of GCSD's elementary schools) ranging in settings from urban to suburban to rural. Researchers asked to see the "standard" for science teaching in the district rather than the district's "star" teachers. One of the schools was a magnet school in its third year. Like the other magnet schools in Garden City, it is an urban, Title I school with 70–75 percent culturally and linguistically diverse students and the same percentage eligible for free and reduced-price lunch. Several schools were newly constructed and relatively large, serving 700–800 students. Classes varied in size from a first grade with 12 children to a fourth grade with 27 children. The presence of minority students ranged from 16–68 percent.

Except for the science labs, classrooms showed little evidence of science underway. It was common, however, to see a kit near a table with the nec-

6 Researchers observed two classes of middle school instruction, not included in this summary.

essary materials spread out at the start of the lesson. All classrooms had computers, although one was reserved for the teacher's use. Most classrooms were arranged in groups of four to six students.

The instruction ranged from very teacher-directed to more student-led, with some features consistent across classrooms. For example, all the introductions to lessons included reviews of students' past knowledge and vocabulary, with the magnet school teacher including a discussion of the careers of different types of scientists. The question or process to be explored was always made very clear, and each class had about 20 minutes for the exploration or activity. In two classes, activities entailed student-directed experimentation, whereas in three classes, activities were very prescribed and teacher-directed. All but one of the classes recorded their results on worksheets or in science journals, and one class recorded and graphed its data. All of the classes ended with some kind of closure, but it ranged from two teachers who explained the correct results to their classes to students explaining to their classmates what they had learned and how they had learned it.

In interviews, teachers expressed an appreciation for the difference between "hands-on" and "inquiry" science. One second grade teacher's description of the intent of the science program, to "give children more of an opportunity to explore and discover some things for themselves," was typical, as was a third grade teacher's statement that the goal of the program was to give "them more hands-on experience." Focus group attendees said that "hands-on is too narrow—[it's] expanded to discovery" and they wanted to "get kids to make discoveries on their own, in contrast to traditional teaching." In addition, teachers discussed the importance of teamwork in the classroom: "cooperative learning and good discussion goes on, sharing ideas."

Teachers discussed the pressures they felt from reduced time for science, the upcoming state-mandated test (Corona Achievement Test or CAT) in science, and the inherent challenges of teaching hands-on science. Almost all teachers referred to the difficulty in finding time to teach science because of the emphasis on language arts—*4-Blocks* in particular—and math. Additionally, teachers referred to the need to prepare their students for the CAT in science. Finally, teachers mentioned the classroom management skills needed to teach hands-on science.

Teachers discussed the pressures they felt from reduced time for science, the upcoming state-mandated test in science, and the inherent challenges of teaching hands-on science.

The combination of these pressures frequently resulted in a retreat from the hands-on, inquiry-focused teaching that Reece has tried to promote. For example, teachers report their increasing use of textbooks as a way to more efficiently cover the subject matter that they predict will be on the CAT. One teacher reported she was "moving to demonstrations in front of the class where the kids watch and answer questions so we can cover more territory." Although over 80 percent of the respondents to the RSR survey of elementary teachers reported that they used science kits often or very often in their science lessons, almost 30 percent reported that they also used text-

books often or very often. One fourth grade teacher reported that "this year the kids are 'active'" and he has done less hands-on science as a result.

Some teachers, however, are eliminating the teaching of science altogether. One experienced second grade teacher, who also teaches an after school science club, noted the results of this lack of science instruction. She said, "We get a sense of this when we get kids up from the grade before and ask them what kinds of things they have been exposed to in science. We ask, 'What did you learn when you were doing *Pebble, Sand, and Silt*, and they say, 'What is a pebble?'"

Assessment

GCSD requires elementary students to be graded in all subjects, including science, but there is no consistent methodology used by teachers to assess their students' understanding of the concepts and skills presented in the science kits. Although some kits contain sample process skills assessments, these are used quite differently among teachers and not at all by many. The variation in use of science labs described earlier also suggests a range in methods used by lab teachers to determine how well students are mastering the material.

CAT, the only districtwide test in use, (see the section on Accountability below) examines language arts and math only. As a result, the only assessment tools available were those provided in the kits, and there was little support or training in their use. The expectation from the state's department of education is that a CAT for science is in the near future. Teachers and principals are anxious about its arrival, but its development has been delayed and its actual date of introduction is unknown.

Professional Development

In general, professional development in GCSD is provided either through the district's professional development office, or through the efforts of each curriculum consultant. In science, professional development is also available through the local Copper Beech Science Center and a local center that is part of the state's systemic initiative.[7] There is little coordination of these resources despite Reece's and others' interest to do so.

District-Level Professional Development

A professional development director, a cabinet position, heads Garden City's office of professional development. In addition to providing professional development, the office is also involved in teacher recruitment, teacher retention, as well as running the extensive teacher evaluation program. Of

7 The state has participated in the National Science Foundations' Statewide Systemic Initiative Program.

the departments' 16-member staff, 12 work on the evaluation program alone. The state standards and the desire to meet training needs as determined by teachers and principals drive the office's professional development workshops. The director said, "I feel strongly that people closest to the work know better what they need…they know the tools they need but we need to be pretty savvy in providing that." She went on to explain that they are trying to move away from the "sit and git notion of professional development…. We are looking for deep, meaningful, and relevant training."

The office provides many offerings for teachers and principals, but few are content-specific. Any content-related professional development comes from the consultant in that area. The director remarked, "The problem as I see it is that you have a great divide—maybe you have this everywhere—an ongoing struggle between pedagogy versus content. Now I happen to be of the opinion that you need both."

The director feels that there is a lot of room for growth for the professional development office. She wanted the departments to work more collaboratively and communicate more easily with each other. She went on to explain that "I envision that my role with the subject area specialists could be to have more articulation with them, to all work more collaboratively with school sites and particularly with principals…. I would like for us all to…get out of the 'power silos' and just roll up our sleeves and do the work."

There is a lot of room for growth for the professional development office.

School-Level Professional Development

GCSD requires that all teachers participate in a total of 30 hours of professional development each year, with 14 of those hours taking place at the school site. The office catalogs the offerings that range from general teaching strategies to leadership and team building to subject-specific sessions. In the 1998–1999 catalog in science, for example, the large majority of offerings were sponsored by the Copper Beech Science Center and the Statewide Systemic Initiative (SSI) Center (see pp. 19 and 20). Also listed were science kit workshops and a meeting for all of the science contact people from the schools.

Schools use different processes to determine professional development offerings that will take place on-site, leaving science professional development vulnerable to the pressures of time. In one school, the principal does a needs assessment; in another, the principal works with a committee. Other principals decide independently. One principal felt that there needs to be a district vision for professional development in science. In his 12 years in the district, there has never been a conversation about professional development for science, but he felt that with the CAT test coming, it will begin. Unfortunately, "it will be due to panic."

There needs to be a district vision for professional development in science.

Principals varied in their willingness to require that teachers attend a particular professional development session. Some principals reported that they can

only "encourage" teachers to go, while others mandated attendance at particular sessions. All principals receive a printout of each teacher's professional development activities, which is sometimes used during annual evaluations. If a teacher needs help with science, he or she would contact the principal who, in turn, would contact Reece directly.

Science-Related Professional Development

According to Reece, professional development is a "hodge-podge at best." The professional development office competes for time and resources with the teaching and learning divisions, and there has been little effort to coordinate their professional development work.

While Reece has given great thought to ensuring that the materials center was accommodating the needs of the program, she has directed less attention to professional development. The only consistent professional development the program offers is orientations to each kit, which are not required. These sessions are one and one half hours long and informally taught by two to three standout teachers at each grade level who act as Reece's de facto leadership team. Nothing is offered specifically to new teachers, though the district does assign each one a mentor—a regular classroom teacher to provide assistance and advice.

Still, teachers do not believe that they need more professional development. In one teacher leader focus group, participants struggled to come up with ideas for additional needed or desired professional development. Their sole concern was the need to integrate science with the *4-Blocks* program. This sentiment was corroborated in the informal RSR questionnaire in which more than half of the respondents said that they felt very well prepared to teach the science curriculum in their grade.

Additional Professional Development Resources

GCSD has two additional and important sources of professional development: the SSI professional development center and the Copper Beech Science Center. They both have significant professional development resources available to the science program, but their relationships with the school district have been complicated, making it somewhat difficult for the program to take advantage of what they have to offer.

The SSI Center: Garden City is home to one of the Statewide Systemic Initiative (SSI)[8] support centers. The SSI, which was "designed to build a statewide infrastructure for supporting mathematics and science" has offered leadership programs in science and math curricula, resources for teachers to check out from their materials centers, family math and science training, and content courses that are co-funded by the district. The

8 The Statewide Systemic Initiative was an NSF-supported program for improving mathematics, science, and technology.

center also has offered science process skills workshops and "teaching to standards" workshops. One teacher commented that it has been a "wonderful resource for training."

However, the fit has not always been easy. The state SSI leadership determines the center's activities, which haven't always coincided with the district's needs. In addition, the district has competed with the SSI for state funds (and may continue to do so). Even though the state provides the salaries for SSI center staff, the director thinks that people perceive it as part of the district. Even with some tension and disagreement over the years, the district-SSI collaboration is improving and the SSI center director and Reece both believe that it will continue to do so. They meet regularly to plan the use of their resources and agree on future projects, such as a data analysis toolkit and a database for tracking professional development.

Copper Beech Science Center: The Copper Beech Science Center is an impressive 62-acre facility that is part of the school district and functions as a resource to the students and teachers of GCSD. It looks much like a science museum and features a planetarium, living history farm, life science lab, discovery and sea life rooms, state-of-the-art multi-media auditorium, a chemistry/physics lab, and a weather lab.

Copper Beech opened in the early 1970s and, since then, it has been supported in part by the district, a fundraising association, and grants from various sources. It has a variety of offerings for all grade levels in a range of the sciences, and it also runs a mandated sex education program for all fifth and seventh graders in GCSD.

The center offers a menu of professional development workshops for teachers on a variety of topics, such as "basic properties of matter and energy," the standards, helping "prepare your students for the CAT," and providing "materials for you to do the activity in your classroom." Weeklong institutes offered in the summer are particularly popular with the many GCSD teachers who attend them, because they provide classroom activities, an abundance of materials, and professional development points for certification renewal.

The relationship between the district and Copper Beech has been strained at times, with conflicts arising over the role of the center in the science program, lack of coordination between the two, and competition for resources. For example, Copper Beech recently decided to offer workshops during the school day without coordinating with the science program or the district. Copper Beech seeks funding from some of the same sources as the science program and the SSI, so they often view each other as competitors. Though they have tried to collaborate in limited ways, Reece wishes there were a way to "force them together," because the continued competition and lack of connection can drain energy and enthusiasm and deprive both of numerous opportunities.

Continued competition and lack of connection can drain energy and enthusiasm and deprive both of numerous opportunities.

DECISION MAKING AND LEADERSHIP

District-Level Decisions

The executive board and the superintendent are the key decision makers in GCSD and can profoundly affect the science program. The membership of the board changes periodically as do members' perceptions of their roles. In the past, the board took more of a management role (one of the factors that contributed to the decision to have principals report directly to the superintendent), while the newer board members have provided more oversight and less direct control.

The superintendent plays a pivotal role, and a new one has just joined the district. Some differences have already become evident. The former superintendent was involved in the program's development, and he ultimately became a strong supporter. Science scores had improved, teachers were committed to the kit program, and children were excited about science. He felt the program had "done so well because the teachers feel they get results and that information goes to the board…the board is very committed to the kit program because they are aware of how well it is going in the schools throughout the district."

The new superintendent is unfamiliar with the program and Reece is working hard to acquaint him with it. The importance of the superintendent's support was put succinctly by one of the SSI center staff when he said, "If [the superintendent] decides that science is a priority, the science program will grow. He can't cut the program, because the local corporations support it, but he could decide that it's in good hands and disregard it," which would, in effect, cause it to stagnate. As he put it, Reece needs "face time" with the superintendent, so that she can let him see it in action. However, as described earlier, gaining access to the superintendent is not easy.

"If [the superintendent] decides that science is a priority, the science program will grow."

The superintendent has been described by many as "data-driven." In light of the important attention the CAT is receiving, some see this is cause for concern as they believe CAT results will not adequately display student learning. Others are more confident that he will be open to other kinds of assessments of student learning. In any event, the way in which the new superintendent will assess the impact and value of any program may be very different.

Within the district's central office, communication is awkward and sometimes tense. The bureaucracy is cumbersome and difficult to grasp—even for those who work there every day. According to Reece, "You won't hear the concept of 'systemic' here. The community knows how to create committees for change and go through the process, but it stops there; nothing really happens." The professional development director commented, "We have tried to collaborate, but in a district this size, you can just imagine how busy everybody gets. It is like the right hand doesn't know what the left hand is doing. Everybody is concerned about that and aware of it." She

"We have tried to collaborate, but in a district this size, you can just imagine how busy everybody gets."

continues, "I have only been here four years, but my observation is that there have been people here a long, long time and there is this sense of power and territoriality."

School-Level Decisions

Decision making at the school level has a significant impact on sustainability of the science program. The principal is in the position to either promote or undervalue the instruction of science. GCSD principals' comments reflected the conflicting pressures they feel on this issue. A great majority of the principals who responded to the informal RSR questionnaire reported that they actively supported teachers' science teaching. Interviews with principals, however, also clearly showed they felt pressure to focus on reading and math to improve student scores on the CAT. Their responsiveness to this pressure is evident in the frequency of their observations of math and reading classes, the emphasis on professional development in reading, and the attention to achievement from one year to the next. Science does not receive this level of attention from GCSD principals.

Communication about the science program comes to teachers and principals directly from Reece. Principals' communication to teachers about science, however, is not always so direct or explicit. One teacher explained, "There is no edict from the district…but sometimes I wish there were." She explained that the district doesn't want to dictate to the schools, beyond expecting that they respond to the standards. Rather, they have an attitude that the schools know what their kids' needs are.

Decisions during the textbook adoption process affect the security of the science program. This process involves the review of materials that have been approved by the state for purchase by districts, and ultimately, the selection of materials by each school for each subject. While the research was being conducted, textbook adoption was underway in science, and Reece was trying to safeguard the integrity of the kit program. She was concerned that the kits did not align perfectly with the science standards and that the CAT would soon include a test in science, for which teachers would need to prepare their students. Reece was concerned that teachers would gravitate toward textbooks as the easier solution. In addition, Reece feels the need to educate and assist principals so that they can sustain the science program's integrity. But the degree to which any of the curriculum consultants such as Reece will be able to influence principals remains to be seen.

Communication with parents about science is also unsystematic and varies by school. At the same time, however, school board members are extremely sensitive to parents' opinions. In one school, teachers were required to send a monthly curriculum-oriented letter to parents. Another school saw "science night" as its way to convey information about the curriculum. There is no mechanism for communicating collectively to parents and for hearing their views on the program.

Program Leadership

Reece, who has been with the program for about 10 years, possesses skills and experience on a national level. She has several national committee appointments and connections to many nationally recognized leaders in science education, from which she derives most of her professional support. While she is frustrated with the lack of science colleagues in her district, she has numerous collegial relationships outside of Garden City that she describes as essential supports "to help me keep it all going."

Reece has a very congenial relationship with the central office administrators and is quite well-known and liked throughout the district. She has a style that has helped her gain credibility and support from teacher leaders who are now an informal group that supports the program. They feel that she is accessible to teachers and visible in the schools. They explain that when she came to Garden City, she didn't try to take over the program; rather, she asked the teachers what they wanted from the program. Teachers attending focus groups also remarked that she was "one of the few curriculum consultants" who is accessible, and principals and teachers praise Reece for her commitment and her approachable manner.

When she came to Garden City, she didn't try to take over the program; rather, she asked the teachers what they wanted from the program.

But, even Reece understands that she needs to develop more skills to move the program ahead. For example, she notes that she misspent an opportunity to work with a science steering committee because she didn't have a clear picture of what the committee should do. Reece explains, "I'm not good at disseminating" and that she is not "astute" at getting things done in the district—that she doesn't have the political savvy necessary to work through the system.

GCSD does not have any formal "teacher leaders," but rather a "science contact" in each building who facilitates on-site information flow about the program. A group of informal teacher leaders lead workshops on the kits and offer support in their schools when asked. The lack of a formalized leadership structure conveys a casual approach to the science program, and leaves teachers who need assistance with few options for getting help. Both teachers and principals expressed the view that if the district was going to be serious about science, it should establish science specialists in the schools.

RESOURCES AND SUPPORT

FUNDING

Funding for the science program is remarkable not because of the large grants the program has received, but because of the steady support from the district over the years. Money from the general fund supports the overall program, and there is a separate budget line item for kit refurbishment and for staffing the materials center. Eisenhower funds have also been an important part of the program's budget.

In addition to program support, elementary schools get $100 each year to spend on science (middle schools get an additional $3,000 per year). Comparing the schools' science allocations to other subjects creates the impression (and perhaps a valid one) that there is little money for science. One elementary principal commented that he gets $12,000 per year for reading, $10,000 per year for mathematics, and only $100 per year for science. The assistant superintendent for teaching and learning confirmed that the amount provided by the district ($250,000–$300,000 per year) would need to double to "do the science program right." But even though it may not be sufficient, she asserted that it is more money than any other subject area receives.

The science program's budget process begins with Reece submitting requests to the executive committee, the superintendent's cabinet of advisors (e.g., deputy superintendent, assistant superintendent for curriculum). The committee negotiates and then sends the request to the school board (as part of the whole budget) for approval. The director of state and federal programs (who is on the executive committee) commented that in the future "we are moving to coordinate strongly with the ATHA Plan for Success," meaning that all budget requests will need to include explicit attention to alignment with the ATHA plan. The absence of a mention of science in that plan suggests that Reece will need to be careful and creative in her future budget requests.

Many teachers, principals, and central office administrators expressed their frustration with Garden City's reluctance to fund education through local taxes. The assistant superintendent for finance confirmed with some regret that although Garden City is the wealthiest city in the state, it is a very anti-tax city, and contributes far less than it could to education. Businesses are often drawn to the city because of its low tax rate, but the lack of public funding for education suggests that the district may not be able to produce the workforce necessary and/or that the schools won't meet the expectations of the corporate employees.

Community and Partnerships

Partnerships abound in GCSD from small school/business arrangements (1,500 at last count) to more significant relationships with the SSI, Copper Beech Science Center, and several large corporations. The latter group of partnerships has the most important impact on the science program districtwide.

The smaller partnerships can be significant for individual schools and for building awareness of the science program within the community. One local business partner provides materials or other resources for family math and science nights. Some businesses have worked with teachers (especially at the secondary level) to help plan and implement lessons that are tied to "real life" science and work. Other industry partners visit the schools to do

demonstrations and discuss practical work and careers in science. All of these contribute to building grassroots awareness of the science program that can be very influential in Garden City.

The larger partnerships took time to build before they bore fruit. The Copper Beech Science Center and the SSI (discussed earlier) represent partnerships with the potential to strengthen the science program. Reece has worked over the years to improve these relationships and her efforts are increasingly paying dividends with the SSI. However, the relationship with the Copper Beech Science Center is one that continues to suffer from problems with communication and collaboration. Though they have compatible views about science instruction, the lack of coordination between their efforts could, ironically, detract from the strength of the science program rather than contribute to it.

GCSD has another influential partnership with SecCorp, a multinational corporation. SecCorp came to Garden City in 1992 and corporate management expressed an interest in becoming involved with education at the state and district level. They wanted to develop positive public relations as well as support a high quality science program for employees' children and for its future workforce. SecCorp moved slowly. Its support began with an "invest as you go" approach, funding individual events that were part of an overall initiative, and based future support on the success of the previous effort. As SecCorp's interest in a statewide impact was satisfied and as its own financial security improved, management has become interested in long-term support.

SecCorp's financial support has had an impact on several aspects of the science program. Reece and her program benefited from statewide support of planning institutes to promote inquiry science programs. She participated in these institutes along with many colleagues from GCSD and the SSI center, giving them much-needed time to work together. More directly, SecCorp has offered to assist Reece with the adoption process by hosting a reception for K–8 principals in which she can introduce them to the materials she wants to promote. Finally, SecCorp management contacted the new superintendent very soon after he arrived in the district to meet with him and discuss their endorsement of the science program.

The partnership with SecCorp has both costs and benefits, noted Reece. Although it provides her with valuable support, resources, and credibility, they come at a cost. Nurturing this relationship has required considerable time and effort, often with no guarantee of a positive outcome. Time devoted to partnership activities took away from making progress on her own program. In addition, because the district is so insular, for political reasons, going outside to develop these partnerships is an endeavor that must be carefully negotiated. Partnerships could be developed with other large corporations in the area, but it would require involvement or at least approval from the district office, which is not an easy thing to acquire.

The partnership with SecCorp has both costs and benefits.

ACCOUNTABILITY

State-Level Standards and Assessment

Like other states and districts in the country, accountability measures have received a lot of attention in Garden City. State standards have been developed in all subject areas, most recently in science, and continue to drive the curriculum and accountability efforts. Unlike others, this state already had a criterion-referenced test in place before national attention called for their development.

The Corona Evaluation of Fundamental Skills (CEFS) was administered from 1978–1995 in grades 3, 6, 8, and 10, covering reading, math, writing, and science. The 10th grade test was an exit exam in reading, writing, and math only. According to the district's director of evaluation, when the new standards were completed, the new test, the Corona Achievement Tests (CAT), was developed and first administered in 1999. CAT focuses on English/language arts and mathematics only, and is used each year in grades 3–8. The state intends to include science on the CAT in the near future. The state has also instituted a school report card system, where schools and districts receive grades based on their CAT scores and other indicators of performance.

Standardized tests are not resisted, but are accepted as a fact of school life. Several people felt that the CAT would help to further the science program agenda. One principal commented that the CAT has had a "great impact on all instruction...for many years we relied on 'sit and git' and a multiple choice test...CAT is not that kind of test. There's critical thinking and open response...it parallels what we have been wanting to do." Another principal commented that the test "…is great…if we are going to value it…I can see it becoming a fourth 'R'…it has to begin in elementary school."

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Many teachers and principals are anticipating the science portion of the test with mixed feelings. Some fear that the curriculum is not well aligned. As one principal stated, "The kits don't lend themselves well to grades," implying that they wouldn't necessarily result in good scores. Another said, "Teachers need to have faith that the kit is going to help with the CAT in this age of accountability." The SSI center director echoes this sentiment saying, "We can use the CAT," meaning that the test will provide the clout they need to get principals to release teachers for professional development. The first science consultant concurred, saying, "As long as there are scores to report, principals will be supportive of ways to support that content area."

The deputy superintendent commented that the science portion of CEFS had a positive effect on the program. "Because we were being measured and evaluated on science, it helped everyone realize that we need to know whether the students actually know this, versus having fun at doing it." Many teachers felt that the lack of testing in science works against instruction, as the absence of a test removes the pressure to teach it.

Anticipation of a test in science alone has elevated its importance. Several teachers believe that with CAT around the corner, school personnel are starting to pay attention to science and that more monitoring of science instruction will follow. However, teachers still face the problem of not having enough time to fit it in. One principal felt that the science portion of the CAT is going to be a wake-up call for the district. He thinks that most principals are willing to demonstrate performance in science if the district is "willing to pay" to support it. A teacher concurred: "As long as science is tested, there is going to be support. There is pressure to make sure our kids do well on the test…it shows up in the newspaper before we even know the results."

Anticipation of a test in science alone has elevated its importance.

Reece questioned the actual feasibility of developing the science portion of CAT. They had already encountered a great deal of difficulty and expense in scoring just the math and reading sections. The answer booklets had to be taken apart and required 24 tractor-trailer loads to send the booklets to Iowa for scoring. This effort required considerable time and expense, which would be increased if a science test was added.

District-Level Accountability Measures

At the district level, Garden City continues to pursue its own accountability agenda through district staff and additional testing. The district administers a norm-referenced test called the MAT7, covering English/language arts in grades 2, 3, 8, and 10. Student scores are reported by school, released to the public, and highlighted in the local media. Garden City employs a director of evaluation as well as a testing coordinator and a part-time statistician. The director of evaluation has focused on two areas: (1) helping the board understand the range of standardized tests administered in the district; and (2) initiating a new program for evaluating and accounting for individual school-level programs.

There is some discussion of developing a district-level assessment that would include performance assessments. The director of evaluation suggested that Garden City was beginning to look carefully at their practice and make decisions about next steps. She acknowledged that they do a lot of testing but, as she stated, "The question is, 'Do we do enough and do we do the right kind?' That is what we need to look at." Reece feels that the current assessment is in the "dark ages" and that a district-level performance assessment would be a step in the right direction.

A district-level performance assessment would be a step in the right direction.

School-Level Accountability Measures

None of the schools have a formal accountability system in place for science instruction or student learning in science. Informal mechanisms include occasional monitoring by dropping in on classes and teacher-principal meetings at the beginning and end of the year. In some schools, science instruction is not observed or assessed in any way. The only dis-

The only districtwide means of monitoring teachers' science instruction is to check the materials that are used from their kits, but that is not done systematically.

trictwide means of monitoring teachers' science instruction is to check the materials that are used from their kits, but that is not done systematically. One principal does ask teachers to demonstrate how they have covered science process skills and adds that his school did some training in that area this year. "The only way to know is to be in that classroom," he added.

Teacher Evaluation

Garden City employs an extremely rigorous, two-year evaluation process for new hires (that takes place in the absence of a teachers' union). First-year teachers are assigned a mentor, required to attend certain staff development offerings, and observed six times throughout the year by members of an evaluation team. The rating process associated with these observations is detailed, and a teacher may be terminated at the end of the first or second year if they do not receive satisfactory evaluations. After completing this phase, teachers carry on largely unsupervised in science.

Permanent faculty are evaluated every year using a "goals-based" process, but teachers don't feel this is a serious opportunity to develop their practice, nor is it an effective monitoring system for their principals. A middle school teacher explained that she just has to write three goals for herself for the year—and that she doesn't necessarily have to accomplish even one. A novice teacher explained that she could do whatever she wanted as long as it was aligned with the standards.

EQUAL ACCESS TO SCIENCE

The governmental affairs coordinator—a lobbyist for the district—believes that "inequity is the biggest problem in the state." The new superintendent raised the issue of equity and achievement gaps only months into his tenure. He noted the obvious and significant difference in SAT scores between African American students and white students and alerted his area superintendents and principals to his desire to close the gap. Although he did not propose specific steps at the time, he indicated that he would be developing a planning process to address the problem.

The lobbyist explained that much of the inequity in the district stems from differences in the monies that communities surrounding each school are able to raise. A reporter from the city's daily newspaper as well as several teachers and principals also noted that schools in more affluent areas had more resources. The affluent schools have more white students, and their parents seem to be able to get their concerns heard by the school administration. One teacher explained that these differences cause resentment between schools.

Teachers and principals in schools that were able to raise additional funds were always aware of the impact of this advantage and realized how much more difficult their jobs would be if their schools were in less affluent

neighborhoods. The financial disparities among schools was evident on RSR visits: Some neighborhoods had large, brand new schools with modern facilities; others were in overcrowded buildings with several classrooms in dingy "portables" on the school grounds. The district has tried to address some of these inequities by transforming some schools in poor neighborhoods into magnet schools to diversify the school population demographic.

This disparity reveals itself acutely in the use and maintenance of science labs. Science labs can only function when a school can raise money to pay for supplies. Some students have no access to their labs at all, while other labs are staffed and elaborately fitted with additional equipment and materials. In several schools, the PTA had not only equipped the science lab, but also created computer labs, and several had built outdoor gardens for pleasure and for use in science.

Some feel that the movement the district is making toward more centralized programs is, in part, an attempt to resolve inequities. The deputy superintendent addressed the issue from the perspective of accountability and spoke about the importance of having high expectations for all students. "We are going to expect—require—results. And some people are going to have to step up in terms of their skills. In the curriculum area, we are going to give principals and teachers everything they need, but we are going to expect them to produce."

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ANALYSIS

The story of elementary science in Garden City is, like any district program, complex. Many factors have contributed to and inhibited its sustainability over time. These factors fall into three general categories:

1) factors that pertain to the surrounding conditions-these describe the influences of the context in which the program operates;

2) factors that pertain to the science program components-these describe the role that concrete elements of the science programs (e.g., curriculum, professional development, leadership) have in contributing to or inhibiting sustainability; and

3) factors that pertain to the whole science program-these describe overarching contributors to and inhibitors of sustainability that affect the program in less tangible but still powerful ways.

These factors do not operate in isolation. They interact with each other, and shift in importance and influence over time. Factors that were particularly striking and pertinent in Garden City are discussed below. For an in-depth discussion of all of the factors, see the cross-site report of this study[8].

8 The Executive Summary of the Cross-Site Report can be found in Appendix E.

Factors that Pertain to Surrounding Conditions

Culture: Navigating the Bureaucracy

Systems as large as Garden City's often have a well-developed bureaucracy that controls the ways in which business is done. To maintain the program, Reece has had to establish strong relationships at many levels of the hierarchy, including principals, teachers, and area superintendents. Reece's maneuverability within the hierarchy will be a key ingredient in sustaining the program into the future.

Communication and relationships in Garden City are guided by the awareness of turf. The need to protect one's own and respect others' seems to influence the ways in which people communicate and work together. For example, Reece's partnerships with the SSI center had to first take these issues into account to build the trust necessary to accomplish common goals. Once a measure of trust was established, issues of turf could be set aside in favor of contributing to shared work. The degree to which people are able to surmount this obstacle varies widely across the district which, in turn, creates challenges for the science program.

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Garden City is a very large district, and its history of division into smaller sub-districts, reunification, and then re-division, has reinforced the tendency of people to think and behave independently, sometimes to the detriment of the district as a whole. This creates difficulties in establishing and growing a districtwide program that, by definition, requires some degree of conformity. This makes the district's success with incorporating the science program into the overall curriculum all the more creditable.

In general, Garden City is an insular district that places little value on going "outside" for professional development. Reece must use her vacation time and her own money for her own professional growth experiences. While this culture supports the development of resources close-to-home, it prevents Garden City from benefiting from knowledge and experiences of others. Thus, learning curves are large and there is little internal capacity for growth and evolution of the program. Seeking out ways to facilitate exchanges of information and experience between educators in and outside of Garden City will be an important support for the continuing endurance of the program.

Factors that Pertain to Science Program Components

Leadership: Closing the "One-Woman Show"

Reece and others describe the science program as a "one-woman show." She is recognized throughout the district as the program's leader, and her accessibility and credibility are acknowledged with sincere appreciation. Reece describes the program as being in a "mid-life crisis." Until now, her approach

has been to build the program slowly and quietly in a district with a culture that appears to be complex and bureaucratic. Without others to share leadership responsibilities, she may not be able to sustain her level of energy and commitment. To move the program past its middle age, it may be important to adjust her strategy or build a more formal leadership team to assist with the work ahead. Reece has established a broad base of support for the program and for herself as an energetic and committed educator, and so the resources are there for her to draw upon if she should choose to do so.

Without others to share leadership responsibilities, she may not be able to sustain her level of energy and commitment.

The ultimate impact of the new district leadership remains unknown. The superintendent could effectively advance it or starve it of resources by relegating it to the backburner. This uncertainty is in great contrast to the uncompromised support the program received from the previous superintendent. His commitment to the program grew out of his firsthand experience with the program and the benefits he had seen it bring to students. Reece must now shift her process of decision making to account for the uncertainty of the current superintendent's buy-in.

Accountability: Accounting for Change

The science program began, grew, and was overseen in a very different time. During the 20 years of the CEFS, science was included along with math and language arts, giving it equal importance. The scores were monitored, but consequences for low performance were mild.

Today with the intense focus on state standards and student achievement on the CAT, accountability has come to mean the degree to which teachers and principals are held responsible for student scores. In the absence of an equivalent state test in science, most agree that science has taken a back seat to English/language arts and math. Teachers and principals alike noted that the bulk of instructional time was spent on these subjects and that, in this environment, science was the "stepchild."

Thus, there is virtually no accountability for teaching science in Garden City. Although some principals in schools with science labs paid attention to the lab schedules, they were in the minority. On average, principals spent the time they had available for instruction on observing English/language arts and math, the two subjects under the most public and district scrutiny.

There is virtually no accountability for teaching science in Garden City.

The common perception of the program was that it was doing very well; it was well liked by students and parents, and free of attention-getting complaints. Several teachers and principals, however, suspected that this benign neglect would end once the CAT for science is in place. Many were anticipating this new test with anxiety, predicting poor student outcomes and, as a result, an adverse reaction to the science program.

Instructional Materials: A Foundation of the Program

Kit use requires a system for allocation, distribution, storage, collection, and refurbishment that is both efficient and reliable. And, even before the kits are managed, they must be either selected or created in sufficient numbers. In Garden City, one of the greatest strengths of the program is the materials center that is well run and successful in refurbishing, delivering, and collecting with accuracy, punctuality, and dependability. Moreover, district funding for the materials center seems secure from year to year, a significant factor in sustaining the program. With regard to the kits themselves, they have undergone a long process of development, which continues. The goal of replacing homemade kits with commercial ones, in addition to reviewing their alignment with the standards, suggests that the integrity of the materials is being safeguarded.

They clearly appreciated the value of the materials and, if anything, perhaps took their dependability and quality too much for granted.

When asked about factors contributing to sustainability, teachers and administrators explained that having the kits and materials center is key and that the only threat to the program was a possible reduction in the money. They clearly appreciated the value of the materials and, if anything, perhaps took their dependability and quality too much for granted.

Money: Steady Support

The science program in Garden City grew incrementally over time. It was initiated with $80,000 from the department of education, and received some additional small grants from the Task Force for Educational Improvement ($15,000), several corporations (over $25,000), and Eisenhower funds. On the whole, however, the district supported the program's ongoing growth and development, providing additional funds from time to time, along with funding for the position of science consultant and increasing funds as the expansion of the materials center required.

"We don't depend on soft money or grants. We feel strongly about allotting the per pupil amount for the subject areas."

This continuing support, remarkable not for the large dollar amounts provided by the district, but for the district's reliability in making funds available, may explain some of the program's security. Garden City has had a tradition of looking internally for support rather than to the outside world. Thus, the practice of seeking financial support for the science program from the district's budget rather than outside funders is consistent with Garden City's culture. One school board member explained the sustainability of the program through community support, citing the success of family science nights as well as their budgeting process. She explained, "We don't depend on soft money or grants. We feel strongly about allotting the per pupil amount for the subject areas." She continued, "It has lasted because of the vision of the people who set it up." She explained that it was not just the personality of the leaders that keeps the program afloat, but the way they set it up as an integral part of learning and a regular part of the operating budget.

Though the program has not had large grants that would have provided many advantages, neither has it experienced the upheavals that often accompany large influxes of money. The program has been able to avoid some of the conflicts and management problems that come with large grants and the vacuum they leave behind when the dollars need to be replaced.

The program's consistent district support notwithstanding, many administrators, teachers, and principals commented on the public's unwillingness to fund education at the level at which they are capable. Educators are continually frustrated by voters' refusal to raise the tax rate for education and decried the loss of teachers to surrounding districts that had higher local funding. One principal commented, "the GCSD taxpayers are never willing to fund the schools to the ability that they can" and implied that possible budget reductions are an ongoing local issue. Although Garden City's businesses have been a source of additional support, no one expects them to bear the core costs. If the program is to continue to mature past its middle age, securing additional funds will be a necessity.

Partnerships: Unfulfilled Potential

A multitude of small, informal partnerships between local businesses and individual schools benefit individual schools, but the partnerships' impact on the sustainability of the science program is minimal. On the other hand, partnerships with corporations, Copper Beech Science Center, and the SSI center have the potential to advance the program. At the same time, however, they could also detract from its growth and stability.

SecCorp support has had a positive impact on the program so far. It has enabled Reece to increase the program's visibility, and its corporate officers are valuable advocates who have already promoted the program to the new superintendent. SecCorp could bring considerable resources to bear on the program in the future, particularly in the areas of planning, leadership, and securing external funding. It has been a willing and active partner as long as its own goals are being met.

Partnerships have the potential to advance the program. At the same time, however, they could also detract from its growth and stability.

An equally constructive partnership with the Copper Beech Science Center continues to be elusive. The potential rewards for collaboration are significant; Copper Beech is a wonderful facility with excellent resources for both students and teachers. But instead of joining forces to advance their common goals of science education and professional development in the district, the programs have carried on independently. As a result, their efforts complement each other only by chance. They accomplish less alone than they could as a team, and they occasionally compete for resources.

Despite the disconnect, Copper Beech enjoys a positive reputation in the schools. It is common for teachers, principals, and others to consider the science center as part of the science program, and they acknowledge the

benefits of the center's professional development and student programs. So far, the estrangement has been invisible at the school levels, and is not an important factor in the sustainability of the program.

Partnerships with the SSI center have been more productive. It was necessary to first establish a level of trust before embarking on common tasks, which took time to accomplish. However, Reece was successful and, as a result, they have been able to engage in work that neither could have done as well had they worked alone. They have been able to think together about professional development, alignment of the science curriculum, and long-term planning for the district. In addition, they have collaborated with local businesses to the greater advantage of the district. Finally, these partnerships provide Reece with some of the collegiality that she has not been able to find elsewhere in the district.

Professional Development: If You Provide It, Will They Come?

Reece commented that she feels she has learned a lot and grown in her understanding of a good science program, but teachers' level of understanding remains a question. The teacher leaders feel confident in their abilities and satisfied with the program, and did not offer any critical reflections on their science teaching nor did they seem to focus seriously on what they are hoping to accomplish with science instruction in their classrooms. Kit training remains voluntary and attendance is not tracked, so it is difficult to know how many teachers who need kit training are actually taking advantage of what is offered. It may be that teacher awareness of training opportunities is not as high as it could be, but when asked, teachers seemed quite satisfied with the amount and quality of training they had already received and did not seem anxious to have more. It appears that maintaining a consistent level of voluntary kit training, without an additional focus on content knowledge or pedagogy, has not impeded the sustainability of Garden City's science program.

Factors that Pertain to the Whole Science Program

Perception: Silence May Cause Neglect

The consensus in GCSD is that everyone is satisfied with the program and there is no reason to change it or think that it might not continue. "When people are not happy, they are not afraid to speak up, call their board member, and complain about it," said the director of evaluation. She explained further, "If it is working, it works. And I think there is a point at which inertia takes over: 'what do you mean we are going to do away with this? We have always done this.'" The first science consultant remarked, "It has been sustained because other people see it as a success. And because they have had success with it, they have wanted to keep it going." The deputy super-

intendent agreed. "When it's not good, I hear from the parents. So no one is currently complaining about the program, and science is not controversial, so it is not on the radar screen." This kind of sustainability through passivity has helped the program grow and develop over time.

At the same time that no one external to the district is complaining, those inside the district perceive the program to be strong and comfortably established. Teachers commented on the importance of support and commitment from "downtown" and felt that the central office was behind the science program. Similarly, central office administrators perceived the teachers as being fully on board, not only with their belief in teaching science but also with their implementation of the program. The regular rotation of kits in and out of the materials center contributes to that perception. But the fact is that no one in the district knows the actual status of the implementation or commitment to the program, nor do they realize how fragile it actually is. Although some of the program's weaknesses are quite real to Reece, they are less apparent to others and they continue to feel confident in the program's strength and appeal. This confidence may soon be tested as the CAT pushes everyone's confidence in the overall educational program, but it seems to have explained much of the program's security up to now.

"It has been sustained because other people see it as a success."

Philosophy: Wavering in Shifting Conditions

In a discussion on sustainability, two strands of philosophy or belief about science come into play. One is about the importance of teaching science at all; and the other is about the importance of using a hands-on approach as opposed to a textbook or lecture approach. In Garden City, both beliefs waver, albeit for different reasons.

In GCSD, the belief that science must be taught is fragile and often falls prey to the pressures of accountability for reading and math. Principals, teachers, and central office administrators all referred to the pressures they felt to focus on these subjects, often at the expense of science instruction. Those who are committed to teaching science because they view it as an important component of their students' education find creative ways to address the pressures. Others view science as an enjoyable but not essential enhancement to the curriculum and, with some regret, let it fall by the wayside. Those who hold no strong belief in the importance of students learning science may even find the increased attention to mathematics and reading a welcome excuse to leave the science program behind. Thus, the call for increased time given to reading and mathematics test the extent to which the core beliefs and values of the science program are, in fact, widely held.

Those committed to teaching science find creative ways to address the pressures. Others view science as an enjoyable but not essential enhancement to the curriculum.

From a historical perspective, the first science consultant reflected that the sustainability of the program to date was due to the grassroots approach to building interest, buy-in and, ultimately, belief in the program—not only for teachers, but for administrators as well. She reflected on the value of

bringing upper level administrators to meetings about hands-on science and having them "know what's going on from the bottom up." This approach to building the belief in the program closely ties to the notion of perception described above: teachers, administrators and board members think of the program as "home grown" despite the fact that the materials themselves are now primarily commercially available kits. One of the SSI center staff commented that "they see it as a GCSD program."

Teachers, administrators and board members think of the program as "home grown" despite the fact that the materials themselves are now primarily commercially available kits.

And yet, the commitment to inquiry and hands-on approaches waivers as does the commitment to teaching science at all. This can be seen in classrooms as teachers use a variety of approaches to teaching science. Although it is commonly acknowledged that the kits are the primary resource, teachers freely mix the use of textbooks into their science teaching in a range of ways. Reece acknowledged that she still struggles to understand and articulate the best balance of inquiry with other instructional strategies and materials. Further, teachers receive a minimal amount of professional development in content and pedagogy that would solidify their understanding and commitment to inquiry. A common pressure cited by teachers is the need to cover all of the standards, and textbooks help address gaps in the kits. In any event, while the sincere appreciation for the kit program is evident, a passion for teaching inquiry science is not evident in the district's classrooms.

GCSD leaders have relied on a grassroots, incremental approach to fostering a belief in inquiry science. Leaders allow teachers to gravitate to the program at their own pace through voluntary kit training. Consistent with the overall culture of the district, this seems to have succeeded in developing a comfort level in teachers. The best way to sell a program to teachers, according to the former superintendent, is to "let teachers experience the program, have success with it, and then they become sold." Feeling comfortable with the program, however, is different from feeling that using a hands-on approach is the best and only way to teach science. As the pressure of teaching to the science standards and to the CAT becomes stronger, the stability and integrity of the kit program may rely on the district's belief in using a hands-on approach. The nature and depth of that belief may become more evident as the program determines how it will address the coming pressures.

Quality: An Unknown Quantity

"Quality" of a program refers to the extent to which the instruction and curricula facilitate positive attitudes toward and student learning of the elements of the scientific process and basic science concepts. In Garden City, as in the other districts in this study, there are no mechanisms that Reece can use to assess the relationships between instruction, curricula, and student

outcomes. Because of the difficulties associated with observing science instruction, she cannot assess the quality of the instruction or discern the impact of the professional development. Principals rarely observe teachers' science lessons, and Reece can't get into enough classrooms to have a sense of how well teachers are using the kits. Without consistent, reliable information about the quality of instruction, Reece is left to make decisions that may affect the future of the program based on her and others' perceptions.

SUMMARY

The science program in Garden City has survived for many reasons. It has built a strong and stable reputation in the district and in the extended community, and its leaders have been passionate and committed advocates who sought the best curriculum materials available, continually attended to their improvement, and established a reliable and high quality system for managing them. The program's leaders have done all of this at a pace and style consistent with the district's culture. The program is considered to belong to the district and is supported by it. These attributes did not accrue over night but have required leaders' steady and strong effort over time.

Garden City now is at what seems to be a critical juncture. Moving out of its time of quiet steady growth, Reece is trying to move it past its "middle age" and into a phase of greater maturity. At the same time the district, like the rest of the country, is experiencing significant pressure to account for students' achievement in English/language arts and math. A new superintendent has entered the district. The state is on the brink of introducing a new standardized test in science. All of these changes combine to create a sense of upheaval and raise the question of whether this is a time to try simply to survive or to press on for the science program's continued growth.