# Inglewood Elementary School
# Lansdale, PA

## A case study about the work of the Merck Institute for Science Education

**Siobhan McVay**

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## Biography

Siobhan McVay is a Research Assistant for the Consortium for Policy Research in Education (CPRE) at the University of Pennsylvania. After completing her B.S. in animal science and secondary teaching certification in the areas of chemistry and biology at Michigan State University, she worked as a classroom teacher for six years. McVay initially served as a junior high science teacher in Chicago, Illinois and later as a chemistry teacher in the Rahway Public Schools (New Jersey). She also was connected with the Merck Institute for Science Education (MISE), specifically as a content area specialist instructional team member for Peer Teacher Workshops implemented through the MISE Partnership. Currently, McVay is pursuing a Master of Science in education degree with an emphasis in teaching, learning, and curriculum at the University of Pennsylvania.

## CPRE's Evaluation of MISE

CPRE, based at the University of Pennsylvania, was contracted by MISE in 1993 to document the implementation of the initiative and assess its impact on districts, schools, classrooms, and students. Throughout the evaluation, CPRE conducted interviews with teachers, instructional leaders, and district personnel; surveyed teachers; developed case studies of schools; and examined student achievement data in order to provide feedback on the progress of the MISE Partnership.

## About this Case Study

This case study is one of four written about schools that have been part of MISE's partnership with school districts over the past 10 years. The case studies are intended to present a story about how the reform has impacted science education in classrooms as well as how it has impacted teachers, schools, and districts. The context for each case study is different as each school and district brings its own unique situation and challenges.

The case studies were written as a result of two or three site visits over the past 10 years, visitations of several days which included classroom observations and interviews with teachers, principals, district administrators, and superintendents. Information was also gathered from evaluation reports by CPRE over this 10-year period, beginning with the 1993-1994 school year and ending with the 2000-2001 school year.

## Acknowledgments

Each of the four case studies is the product of dedicated research and evaluation by a sole author. It is also important to recognize the contributions of several individuals who worked collaboratively with the author, offering insight and guidance, to produce informative and accurate depictions of the implementation of MISE in each of the four schools. The author would like to thank Deanna Burney, Tom Corcoran, Patty Kannapel, Claire Passantino, and Kate Riordan for their efforts and contributions to this work.

## Ordering Information

Copies of this case study are available from CPRE free-of-charge. To obtain copies, email your request to cpre@gse.upenn.edu, phone us at (215) 573-0700, or write to CPRE Publications, Graduate School of Education, University of Pennsylvania, 3440 Market Street, Suite 560, Philadelphia, PA 19104-3325.

## Glossary of Terms

**Merck Institute for Science Education (MISE) Partnership** — Created in 1993 by Merck & Co., Inc., MISE began a 10-year commitment to the goal of raising student interest, participation, and performance in science. MISE formed partnerships with school districts in Linden, Rahway, and Readington Township in New Jersey, and North Penn in Pennsylvania.

**Leader Teacher Institute (LTI)** — Launched in 1995 to provide intensive professional development to a select group of teachers from each partner school over a three-year period. These teachers would then become the Leader Teachers within their schools.

**Leader Teacher (LT)** — Selected teachers who attended LTIs and worked with new teachers by orienting them to the new module-based science curriculum and provided instructional guidance and support.

**Peer Teacher Workshops (PTWs)** — Launched by MISE in 1996, PTWs provided professional development opportunities open to all K-8 teachers in an effort to engage more teachers in science reform. PTWs were open for voluntary enrollment and each was led by a team consisting of a combination of Leader Teachers, content specialists, instructional specialists, and classroom teachers.

**Instructional Team** — The main purpose of the instructional team members was to teach at LTIs or PTWs. MISE held workshops for the instructional teams so they could plan their sessions, gather materials, and learn strategies for teaching adult learners. Some sessions were for all of the instructional teams together, and there were breakout sessions to allow each instructional team to focus on their specific PTW.

**Principal Institutes** — MISE offers a Principal Institute to make sure that principals are remaining informed about various aspects of the reform process.

**Science Mentor** — This position was designated by the district to pilot the new hands-on modules at all grade levels K-5.

**Science-by-Mail** — In the MISE districts, this is a program where volunteer pen-pal scientists from Merck interact with teachers and students of participating classrooms to provide supplemental hands-on science lessons to be used in their classes. Originally created by the Museum of Science in Boston in 1998, the program is now administered nationwide.

**Full Option Science System (FOSS)** — Modules specifically selected for each grade level based on careful examination of the New Jersey Core Curriculum Content Standards for Science. The kits are age-appropriate and cover the range of standards as specified by the state.

# The Evolution of the Merck Institute for Science Education

| Year | Primary Focus | Major Accomplishments |
|---|---|---|
| 1992-1993 | Launching the initiative | Merck & Co., Inc. created the Merck Institute for Science Education (MISE) with a 10-year, $20-million commitment and the goal of raising student interest, participation, and performance in science. |
| 1993-1994 | Building awareness and providing assistance, and setting the groundwork for use of nationally developed curriculum materials | The newly created MISE focused on cultivating relationships with its four partner districts, three in New Jersey and one in Pennsylvania. MISE assisted districts with selection and purchase of new materials for elementary science; and helped local educators envision a new approach to science education by sponsoring their attendance at national conferences, exposing them to state-of-the-art materials and national resources, and encouraging them to visit classrooms with standards-based science instruction. MISE created resource center enabling educators to review and try out new instructional materials. |
| 1994-1995 | Taking a more proactive role, evolving into a single Partnership, and designing and implementing the Leader Teacher Institute | MISE focused on improving the quality and accessibility of professional development for teachers. MISE staff assumed a more proactive leadership role and, in the summer of 1995, implemented the Leader Teacher Institute, enrolling more than 140 teachers. This offered a common professional development experience for teams of teachers in the four districts. This helped create a single Partnership -- MISE and the four districts. |
| 1995-1996 | Increasing resources through a National Science Foundation grant, implementing the Peer Teacher Workshops, continuing the Leader Teacher Institute, and focusing on local policy alignment | MISE received a National Science Foundation Local Systemic Change grant for the purpose of providing 100 hours of high-quality professional development in science and math to 800 K-8 teachers from the four districts over five years. The second year of the Leader Teacher Institute was held. Peer Teacher Workshops were implemented and more than 160 teachers participated in the first summer. As Leader Teacher teams assumed more professional development roles, MISE staff evolved from a supplier of professional development to a facilitator of schoolwide instructional change. |
| 1996-1997 | Continuing the Peer Teacher Workshops, completing the Leader Teacher Institute, and focusing on curriculum frameworks and assessment | Two hundred teachers took part in the Peer Teacher Workshops, which were partially led by Leader Teachers. The final year of the Leader Teacher Institute was held. MISE gave more attention to mathematics. The MISE Resource Center was expanded to include material for elementary and middle school math. All four districts completed draft science curriculum frameworks aligned with state and national standards. |
| 1997-1998 | Increasing district responsibility for professional development, expanding assessment work, initiating comprehensive planning, and continuing work with Leader Teachers | The Partnership had evolved into a broad collaboration. Peer Teacher Workshops were expanded with 138 teachers participating. Communication and leadership skills of Leader Teachers were expanded to support them as advocates, coaches, and instructors in their schools. MISE staff worked to gain board approval for district curriculum frameworks. Work on improving student achievement measures started. |

| Year | Primary Focus | Major Accomplishments |
|---|---|---|
| 1998-1999 | Expanding professional development offerings, strategic planning in science, developing a Partnership Assessment Plan, sharing the work of the Partnership, influencing New Jersey policy | MISE increased professional development offerings in the summer of 1999 and helped districts organize and deliver 36 Peer Teacher Workshops, thus building internal district capacity. MISE staff worked with district teams to develop strategic plans that focused on curriculum and instruction, student achievement and participation, policies and practices, and parent and community support. The Partnership adopted an action plan for student assessment in science. MISE staff expanded outreach efforts with new publications that outlined their vision and work. An assessment sampler for teachers was developed. MISE staff provided leadership to statewide boards and committees developing science content standards and professional teaching standards. |
| 1999-2000 | Continuing the Peer Teacher Workshops, expanding and focusing the work in the middle schools, implementing the Partnership's assessment plan | MISE and the districts offered 31 Peer Teacher Workshops in science and math in the summer of 2000, held in district locations to increase participation. MISE staff expanded and strengthened work in middle schools. Teams of teachers and MISE staff selected, modified, and tested two TIMSS (Third International Mathematics and Science Study) tasks for third and seventh grades. |
| 2000-2001 | Expanding the district role in the design and delivery of the Peer Teacher Workshops, implementing the Principal's Institute, working on site in three middle schools, and working on the Performance Assessment project | MISE continued to offer Peer Teacher Workshops. A two-day institute for school principals was held to increase their understanding of high-quality science instruction and their capacity to help teachers provide it. MISE staff continued to work on the development of curriculum frameworks and the selection of instructional materials for the middle grade level. The Partnership Performance Assessment project was replicated in all grade 3 and 7 classrooms. |
| 2001-2002 | Continuing the enhancement of local district responsibilities for Peer Teacher Workshops, implementing the Principal's Institute, working on site in three middle schools, initiating work at one partner high school, and enhancing the Performance Assessment project | Peer Teacher Workshops reflected the needs of a context where there is a high level of district commitment to standards-based science. A two-day conference continued the institute for principals to focus on their roles in encouraging good science teaching through teacher observations. MISE staff worked with district committees to establish formal curriculum frameworks for school board adoption. Science reform work was initiated at one partner high school using the selection of instructional materials as the reform focus. The Partnership Performance Assessment project was expanded with tasks administered at grades 3, 7, and 8. |
| 2002-2003 | Continuing Peer Teacher Workshops, continuing the Principal's Institute, working on site with middle schools, implementing science reform work at one partner high school, and initiating district-level assessments for science modules | Peer Teacher Workshops responded to the needs of districts committed to standards-based science. A second conference for principals focused on the power of professional dialogue about instruction. Science reform work continued at one partner high school using the selection of instructional materials as the reform focus. Two partner districts cooperated to develop, administer, and interpret summative assessments aligned with instructional modules. |

# Introduction

Situated on rolling hills within the largely suburban, residential community of Lansdale, PA, Inglewood Elementary School serves students in kindergarten through grade 6. The school is part of the North Penn School District, comprised of seven separate municipalities. The school district currently serves more than 13,000 students in 13 elementary schools, 3 middle schools, and 1 high school. Despite the large size of the North Penn School District, the professional community at Inglewood Elementary School has carved out a unique role for itself. The professional atmosphere and commitment to student achievement coupled with a strong partnership with the Merck Institute for Science Education (MISE) formed in 1993, have enabled students at Inglewood Elementary School to receive high-quality science instruction from teachers confident both in their abilities to use inquiry-based methods and their firm grasp of science content.

Located in one of the wealthiest counties in Pennsylvania, the North Penn School District covers 42 square miles and has over 90,000 residents. The community has experienced rapid growth in population as developers pave over family farms to make way for homes and office parks. Many of the new houses in the area are described as "executive homes," reaching upwards of $500,000 in price. Residents in the district tend to have middle- and upper-middle-class income levels, with more recent newcomers at the higher end of the socioeconomic scale.

Inglewood Elementary School is a one-story building organized by grade levels, with three classrooms per grade. Each corridor has assigned grades: a primary wing with grades K-1, an intermediate wing with grades 2-3, and an upper-level wing with grades 4-6. Students at Inglewood are served by 20 regular classroom teachers and several specialized teachers. Besides instruction in core subjects — reading/language arts, mathematics, social studies, and science — students receive art, music, and physical education. Special programs and services are also available to meet the needs of individual students. The school offers a Gifted and Talented program, speech service, English-as-a-second-language, reading and mathematics supplementary instruction, as well as instructional support. For the most part, students receive their science instruction from the regular classroom teacher. The exception to this is in grade 6, which is semi-departmentalized. At the sixth-grade level, one teacher instructs all classes in science. One principal administers the school.

With just over 480 students, Inglewood is one of the smaller elementary schools in the district. Students are proportionally distributed across the grades with the exception of a slightly smaller kindergarten population (11%) and a slightly larger sixth-grade population (17%) as compared to the other grades. Using free and reduced-price lunch counts, state data indicate 8.5% of the students are from low-income families. This percent is slightly lower than the district average of 11.5% and much lower than the state average of 30.8%. Demographically, the background of the school's students parallels the racial/ethnic diversity of the North Penn School District. About 84% are White and the remaining 16% represent a variety of racial/ethnic groups.

# The School

Upon walking into Inglewood School, a visitor would be immediately struck by the well-lit hallways adorned with student work. Not only does the school proudly display artwork, haiku poetry, and reports crafted by students on the bulletin boards, the students, along with an "artist in residence," have created a

beautiful mural that decorates the hallway directly across from the main office. As students move through the halls, they smile and wave to visitors while quietly moving to their next activity or class. Everything about the school conveys a positive and encouraging atmosphere.

Several main bulletin boards in the front hallway highlight the Inglewood STAR program. The principal describes the STAR program as follows:

> *We have to recognize, affirm, and celebrate positive behavior in the students. I asked for volunteers to join the STAR team. Teachers came in on their own time (were not paid) and we began to talk about this vision. STAR stands for "School Spirit," "Teamwork," "Academic Effort," "Responsibility." We created benchmarks for these categories. We also have North Penn School District universal values. We need to celebrate them and talk about them as well. We fused the STAR team and the North Penn universal values. We celebrate two values per month. Students in the morning (over the public address system) talk about how they work toward those values. Each month, grade-level teachers identify students who have lived those values. They become an "Inglewood STAR." We then have a STAR day, with a special teacher and certificates from the state.*

In addition to the STAR program and focused attention on the North Penn universal values, the principal has created another program to recognize students for good behavior and positive leadership. The "I was caught being good at Inglewood!" concept was created by the administration so that any adult in the school can award a certificate to students who are "caught being good." As students receive certificates for good acts, they place them in "The Good Bin" that is located in the cafeteria. At the end of the week or month, a drawing is held and prizes are awarded to lucky "good" students. Even visitors to the school are encouraged to participate in this program. Visitors receive certificates in the main office and can distribute them to students they encounter during their time at Inglewood.

Such programs that encourage good behavior and reward positive acts are not the only things generating positive energy in Inglewood School. Teachers spoke repeatedly of the collegial climate among the teachers that fostered professional behavior and a positive atmosphere.

> *Teachers are close-knit. We see each other outside of school. The kids see teachers model friendships. That has an impact.*
>
> —Kindergarten teacher

When teachers were asked about what makes Inglewood unique as compared to other elementary schools, they point to the emphasis put on professional development, collaboration between teachers in grade levels, strong relationships, commitment to excellence, and support received from the administration and other teachers while implementing new programs or curricula. A former first-grade teacher spoke highly of Inglewood School. She recounted that, after earning her masters degree, she had declined opportunities to move to another school, preferring to stay at Inglewood:

> *I knew enough that I knew I didn't want to leave.*
>
> —Former teacher, current librarian

In 1993, MISE formed a partnership with four school districts. Three school districts in New Jersey were part of this innovative effort to reform science education in elementary schools, and the fourth member of the Partnership was the North Penn School District. To fully appreciate the dramatic impact the MISE initiative has had on elementary science education

in the North Penn School District, one must first understand the centralized nature of the district. When the North Penn School District was formed in the mid-1960s through a merger of seven smaller districts, assurances were made that a standard, consistent program would be provided to students throughout all schools in the district. The vehicle for this has been a process called "Goal One," established to assure accountability and equal access to all programs for students throughout the district. Among other things, Goal One involves a planned, cyclic review of curriculum, the use of standard materials throughout the district, instructional guides or pacing of instruction, and end-of-year (or course) tests for program evaluation.

As evidenced by the Goal One process and procedures, North Penn has maintained a highly centralized approach to curriculum, teaching, and testing. The district advertises to parents that the schools have common programs and a uniform curriculum in which the same textbooks are adopted district-wide. According to the Director of Elementary Education, this strategy enhances accountability and allows teachers to concentrate on teaching.

## Science Instruction — Then and Now

At the time North Penn entered into the partnership with MISE in 1993, the science program at the elementary level was textbook-driven. Teachers used Heath textbooks and followed pacing plans as outlined in prescribed curricula for each grade level. Paper-and-pencil tests were given at the end of the year to evaluate the science program. This highly centralized approach to instruction may lead one to speculate that innovation was absent in North Penn, but this assertion would not be entirely fair.

During the 1990-1991 school year, a Merck employee who had been actively volunteering in schools with grades 4-7 in two districts in New Jersey became interested in working more directly with students in his own school district in Pennsylvania once his own children began elementary school in North Penn. During the following school year, the parent made contact with North Penn teachers and principals and, with funding from Merck, a new program was implemented in several elementary schools throughout the district. "Science-by-Mail" is a program where volunteer pen-pal scientists from Merck interact with teachers and students of participating classrooms to provide supplemental hands-on science lessons to be used in the classes. Teachers were enthusiastic about the available materials and were pleased with the increased interaction with scientists who work in their community. Inglewood Elementary School had several upper elementary teachers involved with the Science-by-Mail program.

Shortly after the Science-by-Mail program was implemented in the North Penn elementary schools, rumors of a pending partnership with MISE began to circulate within the school district. Parents, teachers, and administrators were thrilled by the possibility of partnering with a renowned leader in scientific research.

Careful examination of the past science curriculum in North Penn reveals an interesting progression. Many years ago, the district used a curriculum called "Science: A Process Approach" (SAPA) as the basis of its elementary science instruction. Some veteran teachers describe SAPA as approaching science in a similar way to their current hands-on curriculum based on "modules"; curriculum units that contain all the teacher resources, activities, and material to promote hands-on science while developing critical thinking and problem-solving skills.

However, they pointed out that the current science modules contain an enticing array of projects that are intrinsically more motivating for youngsters. Not only did teachers feel SAPA lacked "fun" activities to do with students, but principals report that it failed because of a lack of district structure to support it. Materials were not supplied on a regular basis to restock consumables and the student assessment piece was not strong enough to support program evaluation as dictated by Goal One. Once a new curriculum was adopted, SAPA was discontinued.

After SAPA, the district resorted to a more traditional approach. Heath textbooks were adopted and the pacing throughout all elementary grades was directly linked to the textbook. Although some teachers found experiments and hands-on investigations to do with their classes while using the text-based curriculum, many teachers who lacked confidence or knowledge in science resorted to a more rote method of instruction:

*The elementary program is textbook-based and the tests are based on the text tests...The students just need to learn what is in bold print in the text. My three kids went through the district and this is how I helped them study for tests...learn the boldface type!*

—Parent and district administrator

*The science program is terrible. At the elementary level, it is boring and focuses on learning without hands-on; it is very intermittent and unfortunately driven by Goal One objectives. The Goal One requires that the kids have certain skills and knowledge, but it does not require that the teachers do any hands-on teaching in the classroom setting.*

—Parent

*Much of the program depends on the practitioner. It is the luck of the draw. Some of the students flourished, depending on the teachers.*

—Supervisor of mathematics

Fortunately, both parents and teachers were equally displeased with the text-based science curriculum. Although only a vocal few voiced their concerns publicly, many were eager to move toward a more hands-on investigation approach to science. Two Merck volunteers who had been working with teachers and students with the Science-by-Mail program met with teachers and principals to investigate other ways to support the district's science program. District representatives attended a National Science Resources Center convention in 1992, during which they heard about new science modules or "kits" available for elementary schools. The representatives came back from the convention enthusiastically seeking a new module-based curriculum. In the 1992-1993 school year, two schools in the North Penn School District agreed to pilot hands-on science modules in their classrooms and Merck covered the costs. Teachers at each grade level in these schools received training from the manufacturer and one module to supplement their current text-based instruction. At the end of the pilot period, it was clear that teachers, students, and parents were enthusiastic about the modules. Some parents were even upset that only two schools got to participate in the hands-on pilot program while others did not. They felt that children in schools without the new program were at a disadvantage.

*Now these same schools are going to get to expand the program, but it's annoying to think that in a different school the kids aren't getting the program. That's a shame. Some parents are really angry about this, especially the parents whose kids aren't getting the program.*

—Parent

Once the partnership with MISE was established, more funding became available for new science materials and profes-

sional development for teachers. The implementation of a hands-on science curriculum driven by science modules began to proceed throughout the 13 North Penn elementary schools. It was clear that North Penn had made a commitment to a new way of teaching science that was supported by experts at MISE. Teachers in Inglewood were strongly in favor of the new approach to science.

> *Everyone's been touched a little bit. I think to take that angle first, the teachers who have not been directly involved in teaching from these hands-on units can't wait to get them, because the reports are very positive.*
>
> —Former supervisor of science

By 1995, teachers in Inglewood had wholeheartedly adopted a hands-on approach to science. Observations of science lessons and interviews with teachers revealed that they had effectively incorporated hands-on activities into every lesson. Teachers saw several clear benefits to hands-on instruction:

- Students were more actively engaged,
- Children expressed a greater enjoyment for science,
- Students at all levels were able to make clearer connections to their everyday lives, and
- Complex concepts seemed to come more easily to students.

The slow pace of implementation of modules was the major complaint from teachers. Even though modules were incorporated into Inglewood's curriculum, only a limited number of modules were available for use. In 1995, only one module per grade was being used and the adopted modules did not fill the entire school year so textbooks were still being used for instruction when modules were not available.

> *It is much better than that book that we had 10 years ago, that textbook. We just read out of the book, I mean I did activities on my own that I had created from college, but that was only because of me.*
>
> —Leader Teacher

> *When I taught my first five years, they [students] were not excited about it. Now they are like, "When are we going to do science? When are we going to do science?"*
>
> —Fifth-grade teacher

From 1995 to the present, Inglewood has worked in conjunction with North Penn and MISE to steadily increase the use of hands-on techniques in science instruction. A major element of this effort has been to move away from textbooks as the backbone of the science curriculum and toward the sole use of science modules throughout the academic year. Currently, the North Penn School District has adopted several science modules for use in the elementary schools. Each grade from kindergarten through grade 6 has four modules to complete throughout the school year (with the exception of grade 1, which completes three). These science modules were selected following a thorough review of district and state science standards, Goal One objectives, and science frameworks that were created through an effort supported by MISE in the Partnership districts. (See Appendix A for a breakdown of which modules are used in each grade level.)

The increasing use of science modules in Inglewood School did not come about without problems. The teachers overwhelmingly endorsed the use of modules, seeing clearly the benefits to student engagement and learning. However, several management problems arose during the early years of module implementation. Using hands-on techniques proved to be more time-consuming than working directly from a textbook. Teachers found much of their preparation time for science was spent organizing equip-

ment and working through all of the new set-ups that were part of the modules. Because modules were shared among elementary schools on a rotating basis, the district had to coordinate distribution. Several teachers reported receiving modules at inappropriate times during the year. Inglewood teachers described monitoring the life cycle of butterflies only to get to the final stages and have to release the classes' butterflies during the middle of winter! Teachers found that when they received the modules that made use of live specimens, many of the specimens would often arrive dead. The planning, restocking, ordering, and organizing aspects of the new method of teaching science became daunting tasks with which the school district had to contend.

With innovative ideas from the district science coordinator and the creation of a science resource center in the district, many of the management issues were solved. The process of restocking the modules was streamlined and a computer tracking system was implemented. Other changes included laminated inventory sheets that accompanied each module and price lists of non-consumable items so that teachers would understand the fees involved in replacing such items. Ordering cards were also included in each module to minimize work for teachers and to facilitate ease of ordering. Over the course of the module implementation, teachers have kept certain things from the kits to supplement their classroom once the modules leave. As a result, the district is considering supplying generic materials to enhance instruction at the elementary level.

As teachers became more familiar with using the district-adopted modules, they were able to move past the initial problems associated with module and materials management. The teachers at Inglewood began asking deeper questions and finding that more pressing issues needed to be addressed. Teachers needed deeper background knowledge in science to feel comfortable presenting the content in the modules without detailed notes. They also found some inconsistencies within the early teaching manuals as students began to work through the experiments. Teachers did not feel they had enough science content knowledge to address these deeper issues properly. Fortunately the teachers at Inglewood had a strong group of Leader Teachers and a supportive principal to whom they could look for assistance.

## Leadership and Professional Development

The developers of MISE had the forethought to realize that implementing such a drastic reform in elementary science education in Partnership schools would require support from significant leaders, not only at MISE, but also within each school. In the spring of 1995, MISE instituted the Leader Teacher Institute (LTI) to provide intensive professional development for a select group of teachers from each school. The institute was designed in such a way that it was thought this group of teachers would then become the "science leaders" within the school. Over the course of three years, by participating in intense summer workshops and study groups throughout the school year, the Leader Teachers would become well-versed, not only in science content in each of the three strands (earth, life, and physical), but would also have an in-depth, working knowledge of the pedagogy associated with inquiry-based instruction.

Six teachers volunteered to be part of the LTI from Inglewood School, including all three fifth-grade teachers and one teacher each from grades 3, 4, and 6. (Currently, three Leader Teachers at Inglewood remain on staff: two originally from Inglewood and one teacher who

came to the school after attending an LTI from another North Penn elementary school.) Leader Teachers at Inglewood had high praise for the institute. The quality, breadth, and depth of material presented was remarkable, along with the time allowed for collaboration among colleagues. Teachers who participated were overwhelmingly positive about the experience.

*The teachers who are on the team are master teachers who take great pride in helping other teachers.*

—Principal

Use of Leader Teachers once the institute had ended varied among schools in the MISE Partnership. At Inglewood, the Leader Teachers carved out a niche for themselves within the school and created a team focusing on themes in science and math throughout the school year. The Inglewood Science, Math, and Technology (ISMAT) team met together at least once a month before school to plan science themes, discuss issues associated with the new curriculum, model inquiry-based lessons, and provide a support network for teachers around science and math. A sixth-grade teacher was one of the original Leader Teachers who was integral to the success of the ISMAT team and the progression of inquiry-based science at Inglewood School. He emphasized the importance of the ISMAT team in providing assistance for teachers and in demonstrating the ins and outs of teaching using inquiry-based methods. When asked, many teachers in Inglewood School referred to him as the science leader in the school.

*If I ever had a question about science, Mark would be the person I'd go to.*

—Kindergarten teacher

Although the guidance of the Leader Teachers provided much-needed support to teachers struggling with difficulties associated with implementing the new curriculum, teachers still felt they needed more. Many teachers were uncomfortable with their lack of knowledge regarding the science concepts presented in the modules. MISE recognized the need for professional development for all teachers who would be using the modules. Although Leader Teachers were clearly having an impact in schools, MISE sought to accelerate the pace of change, deepen teachers' content knowledge, and strengthen professional practice through additional training.

*I think I see the greatest need in staff development. The most critical issue over the long haul is staff development. And teachers, I think particularly elementary teachers, never feel that they have enough knowledge. They never feel they have enough content knowledge. They're so afraid to say, "I don't know."*

—Former science supervisor

During the summer of 1996, MISE began a series of professional development opportunities called Peer Teacher Workshops (PTWs). PTWs were open for voluntary enrollment to all K-8 teachers in the Partnership schools. The PTWs were shorter in length than the workshops offered through the LTI and reached many more teachers. PTWs worked to "broaden the scope of the Partnership's work and engage more teachers in the reform of science and mathematics education" (CPRE, 1998). The instructional teams that presented each PTW consisted of some combination of Leader Teachers, content area specialists, instructional specialists, and classroom teachers who had familiarity with specific topics or modules. Leader Teachers from Inglewood have been highly involved in PTWs from their onset as instructional team members. District leaders appreciated the level of support the Merck initiative gave to this effort.

*We could have bought the kits, hands-on materials, but not the professional development...I heard just last month from a Board member, "one thing we don't want to do is reduce professional development." Whew!...Merck is a good neighbor, influenced Board's thinking.*

—Superintendent

Many teachers from Inglewood have participated in PTWs since the summer of 1996. (Since 1996, 81.5% of current teachers have attended PTWs, totaling 2,831 professional development hours in science.) Most participants have responded positively to the workshops. Teachers feel that during the course of the four days spent in the summer and the follow-up sessions that take place during the school year they are able to network with teachers in other schools and grade levels, they are treated as professionals, and they are able to take a closer look at the content and skills presented in specific modules. Without these PTWs, many teachers feel they would have been at a loss when teaching the new science curriculum.

*I enjoy science because it is hands-on. In the beginning, it was scary. "How's it going to go?" But the workshops help you get over that. All experience the same things; we hear how others did lessons. There is a lot of sharing at workshops. We go through the manual again and analyze each lesson, get ideas to make it better.*

—Second-grade teacher

*Merck's influence depends on who has taken the professional development, but it has provided us with a vocabulary. We are all talking about the same things. An overwhelming number of people take the PTWs. We have a vocabulary and attitude of what it should look like; that translates into everything you do. Can't turn it off, there is a lot of carryover all over the place.*

—Sixth-grade teacher

The increased content knowledge and training in inquiry-based pedagogy that teachers received through participation in the PTWs translated into better classroom practices. Teachers saw their students becoming more engaged, and teacher observations noted an increase in higher-order questioning techniques and students undertaking the process skills involved with science (recording data, making observations, creating experiments, and analyzing results) more frequently. In addition to the positive growth seen in the classroom, the professional community within Inglewood began to grow stronger. As teachers began to network across grades and schools, collaboration increased. Teachers participating on instructional teams began to see themselves as leaders in the school, a fact that empowered them to move forward in areas of instruction both within their classrooms and the entire school. Teachers spoke of themselves as "change agents" and "leaders" in the school. Including classroom teachers on the instructional teams that led PTWs may have been crucial to this perception. Despite the centralized nature of the North Penn School District, teachers and administrators perceive the change in science education as happening from within rather than from the top down. Administrators noticed positive changes and affirmed that this new science was here to stay.

*The real staying power from reformers is on the inside. The key partners are teachers who are enlightened, equipped, and motivated.*

—Superintendent

*Our staff could begin to see. It validates for them that they begin to see themselves as leaders, as having expertise, knowledge to share with their colleagues.*

—Superintendent

Having classroom teachers instruct their peers helped ensure that workshops were tailored to the needs and professional practices of the teachers themselves.

*The old methods of experts instructing and expecting teachers to carry it out are not effective or efficient. But there is emerging evidence that when teachers themselves are the change agents, they are the leaders, change is non-threatening, because people know them. "I've known Helen Smith for years." That's a powerful way to engineer an environment for change that I think MISE represents. I'm probably high on MISE more for that than for the curriculum.*

—Superintendent

Throughout Inglewood School, teachers recognize the need for sustained professional development in order to keep moving forward in science reform. Even though the district has had staff developers from before the MISE Partnership began, teachers never experienced the quality of professional development that they received at the PTWs. The workshops were responsive to teachers' expectations and were seen as immediately applicable to the classroom setting. Administrators admit that one of the more important aspects of the partnership with MISE was the access to high-quality professional development for their teachers.

*Usually the workshops are negotiated to the direction of meeting the needs of the people involved.*

—Second-grade teacher

*MISE has raised our awareness that we have experts right here. We don't always have to go outside the district.*

—Curriculum coordinator, secondary math and sciences

## Professional Community

*This is a talented staff with wide backgrounds. Many teachers are interested in science. Many take MISE summer classes. In second grade, we have all taken PTWs.*

—Second-grade teacher

Inglewood Elementary School epitomizes professionalism at its best. Teachers in the school not only speak and look like professionals, but almost everything about the structure of support within the school fosters a climate of professionalism. Sitting in the faculty lounge, one can't help but notice the surrounding bookshelves that are stocked with professional journals and books on teaching, students, and particular subject areas. The teachers sitting around the table teach similar grades because their students are all scheduled to be in lunch at the same time. The teachers discuss committee meetings and student progress. One teacher mentions an approaching social studies unit, trying to elicit new ideas or thoughts. The atmosphere is one of collegiality and shared responsibility for student learning.

*Merck has opened up a new world for teachers. The result is that they are more collegial. They really talk with each other across the grades.*

—Principal

In recent interviews with researchers from the Consortium for Policy Research in Education (CPRE), teachers discussed grade-level planning time. The school recognized the need for time to network with colleagues, as well as for a structure to facilitate such activities. Teachers report to school at 8:20 a.m., although the school day does not begin until 9:00 a.m. During these 40 minutes without students, faculty members participate in a wide variety of school improvement committees and also have the opportunity to meet with other teachers to dis-

cuss school-related matters. (This is also the time when the ISMAT team meets monthly.) Most grade-level teams choose to plan lessons together after school. On their own time, grade-level teams meet and move through the planning process together to ensure all are on the same page and to elicit new ideas, strategies, and anticipated difficulties for upcoming units. This planning time is purely voluntary, yet all teachers reported using after-school time for collaboration with peers. Over and over again teachers described the collegial atmosphere and dedication to students as the positive draw to Inglewood School.

*We meet once a week, have a grade-level meeting to talk about what we are doing and what is coming up. Merck has helped because getting to know others in the grade level has helped to network, get ideas, and keep in contact.*

—Second-grade teacher

*In fifth grade we share everything.*

—Fifth-grade teacher and Leader Teacher

The current principal at Inglewood School regards the entire staff as professionals. She acknowledges the shared responsibility among members of the faculty and staff for the students they serve. The principal's high regard for her teachers was displayed in the impeccable attention to detail and schedules during CPRE researchers' visits to Inglewood. Teachers reported they had even been part of the planning process for visits. It should come as no surprise that a school with such a climate of professionalism showed such positive growth when presented with high-quality professional development opportunities through the MISE Partnership.

*We are all professionals. Let's learn together.*

—Principal

*[The Partnership] pulls the school together, puts everyone in the same mind-frame.*

—Librarian

Teachers reported support from their principal as one of the key factors in their success in the classroom.

*The support, and a lot of support from our principal. The building principal is wonderful and I mean that seriously because any kind of materials that I need, I mean the kit is wonderful, the Merck kit that you get — everything is pretty much in there. But anything that I need or separate things that I need — like we were a little weak on assessment and have had to develop that over the years — if I go to her and say, "Look I need money to get this or get that or whatever," I get it. So that is what is different about this school than the one that I had been in before, because you have that support there.*

—Fifth-grade teacher and Leader Teacher

## Inquiry-based Science

*Change takes a long time. MISE said it would take five years...Change has taken a long time. It surprised me that practices changed and ways of thinking changed.*

—Elementary science coordinator

The adoption of hands-on teaching practices in science seemed to come quickly to Inglewood School. Teachers had some experience working with hands-on lessons and Merck volunteers through the Science-by-Mail program and, after hearing about the modules being piloted in two other North Penn elementary schools, were anxious to move forward. Teachers implemented the new modules immediately upon receiving them. They enthusiastically attached themselves to the new curriculum. After the initial stage of implementation,

teachers in Inglewood began to reflect more critically upon science instruction. Once the teachers participated in professional development, they began to see areas in their lessons that could be further improved. Teachers wanted to move past hands-on approaches into more student-focused inquiry lessons. While hands-on science took off quickly, the more deliberate change toward inquiry-based methods would move more slowly.

*We had a lot of hands-on, but it was cookbookish. We did it, but now we're trying to take the inquiry approach with them [students] discovering on their own.*
—Leader Teacher

*We're talking about science instruction, but overall we're talking about changes in the way we teach teachers, so that we can teach kids to be better thinkers. We have a much broader mission here.*
—Former supervisor of science

One of the first signs of the shift in priority toward the new science curriculum was evident in the scheduling of science instruction. Before the change to hands-on science modules, teachers did not necessarily teach science everyday. Social studies and science were given about the same amount of time and usually taught at the end of the school day. Science lessons often took the form of reading in the science content area. Science facts were emphasized, and students learned boldface words from their textbooks in order to score well on unit end assessments. The innovative curriculum coupled with a renewed emphasis on professional development for teachers in science created a positive energy surrounding science instruction. Since Inglewood School has adopted a hands-on approach, priority is given to science instruction.

*It [science] didn't even used to be taught every day. It's institutionalized how and we're finding ways to integrate science with high-stakes topics.*
— Supervisor of mathematics

Students in Inglewood School immediately adapted to hands-on methods of science. Teachers report that their students thrive while interacting more personally with concepts because students discover things for themselves. Students make sense of foreign ideas via more inquiry-based methods, rather than simply accepting new content as read directly from the text.

*[Now] kids move around, feel in control of their learning.*
—Curriculum coordinator, secondary math and sciences

*They [students] are building more lifelong learning skills, helping them to discover how to discover for themselves. If they want to know why clouds are shaped like that, the student knows, "I can figure that out for myself." We are giving kids skill in how to discover on their own. They are more confident in taking risks. They are moving to not such a clear definition of right and wrong.*
—Leader Teacher

For example, teachers in the third grade have been using a module called "Animal Studies" for several years now. Part of the module includes a series of lessons centered on students constructing terrariums for several types of animals, including frogs, turtles, and snails. One teacher described the process of change and progression she has seen in the way in which she approaches these lessons. When the students first began using the module, they were given specific instructions that detailed how to set up the terrariums for each type of animal. The directions outlined everything necessary for a successful terrarium, from the amount of gravel and soil to use to the

type of food to be given to each animal and light in which the terrarium should be set. Students followed the lesson plan, learning about the animals, but proceeding in a very regimented way in order to complete the unit.

As teachers received more professional development in inquiry-based instruction, many realized they desired to move toward a more student-centered ideal. Teachers not only wanted their students to get actively involved in the process of science, they wanted their students to answer questions and to learn science content in ways that would be meaningful for them. The same teacher described what this unit on animals looks like, almost 10 years after MISE began its partnership with Inglewood School:

> *The hand-on series of lessons on animal habitats is introduced to students and they choose from one of the types of animals to be used for the study. Once students have selected a range of animals, the research begins. Students are assigned the task of constructing a habitat that will be most suitable for their specific type of animal. The class spends several science lessons researching, using the available technology on the Internet to find out more details about their specific animals.*

In groups, third graders make decisions regarding what type of ground cover will be most suitable for use in their terrariums, the source and amount of light, and the nutrients required for the health of the animals. While discussing plans with their peers in cooperative learning groups, students make choices based on available materials (that have been neatly arranged on a supply table in the science classroom) and design their own list of instructions for the construction of their terrarium. Instead of following a protocol created by the module manufacturer, students proceed through the steps of their own instructions in order to create the ideal habitat for their animal. Once the terrariums for all species have been created and animals are living in the spaces created for them by the students, the teacher moves students into new groups for the next several observation days. This gives each student an opportunity to be both an expert (by teaching fellow classmates about their animal and the habitat they designed) and a novice (by learning from others the rationale behind designing the best habitat for the different species used). While interacting with technology, the teacher, the science materials, and one another, students access difficult concepts more readily and take ownership of the material as it becomes real for them — the "scientists" of the classroom.

> *There is an attitudinal shift that's occurred, a different attitude that translates into everything they do. They have more responsibility — very much so. It allows the teachers to take risks. If it doesn't work out, you figure out what to do. With the kids too, they said, "This isn't working. What can we do?" It is a lot different.*
>
> —Leader Teacher

Attitudes about science have changed at literally every level in Inglewood since the curriculum moved toward more inquiry-based instruction. This type of instruction requires a tremendous amount of preparation time on the part of teachers, as compared with the traditional textbook-based curriculum of the past. Despite the increase in prep time, teachers overwhelmingly support the move away from teacher-centered instruction and toward more student-based learning. Not only are teachers happy with the modules, they strive to build more inquiry lessons into the modules and have students explore answers to questions, while wrapping their minds around science content.

> *When I walk into a classroom, I expect to see students actively engaged...I'd like to*

*see the teacher working as a facilitator, working with groups. Takes onus off the leader as dispenser of all knowledge and students actively seek information and answers. More questions than answers in the classroom.*

—Curriculum coordinator, secondary math and sciences

Recently a kindergarten teacher described an inquiry lesson that made use of available technology in her classroom last year. As an introduction to "senses" the teacher placed several foods on a table in the front of the room. She explained to the students that they would be using one of their senses — taste — to examine foods. Students would have the opportunity to taste foods, some familiar and some new, to discover some of the similarities and differences. With a smile on her face, the teacher describes the rush of many students toward the baking chocolate that was on the table. Students reached for large pieces, anxious to put the delectable treat into their mouths. As students reached forward, the teacher cautioned them that not everything would taste familiar; that some things may look like foods they have had in the past, but may taste very different. Students were advised to try small amounts at first, before taking larger bites. Shrugging off the words of caution from their teacher, several students shoved large chunks of baking chocolate into their mouths only to find out that baking chocolate did not taste as sugary sweet as "regular chocolate." The teacher described students spitting chocolate into napkins and rinsing their mouths with water as she smiled, knowing they had learned about the taste of bitter substances.

Because students had experienced the unexpected taste firsthand, they were anxious to know more about it. Students also wanted to know why anyone would buy baking chocolate, what they would use it for, and how it would be made. Seeing an opportunity to teach the prescribed science content through the exploration of student-generated questions and enthusiasm, the teacher sat her class on the carpet and, after all had properly rinsed the taste of baking chocolate from their mouths, pulled the large television monitor to the front of the room. The teacher linked the monitor to her computer and as the students watched the screen, she accessed the Internet. She then typed in student questions and with their help in making decisions about which links to pursue, the kindergarten teacher led the class through a series of websites from which they all learned not only more about baking chocolate, but also about the difference between sweet and bitter tastes and more information about the sense of taste in general. Because students had a real-world link to this new content and they had generated questions to which they desired to know the answers, science came alive for them.

Teachers have not been the only ones who are excited about the new science curriculum; parents and students are enthused as well. Before the hands-on modules, parents were ambivalent or even disheartened by the text-based, content-driven methods. Now, as students are learning rich content, while actively involved in the process of science, parents are thrilled with what their children are seeing and hearing about in classes.

*This year's been the best year my older child has had. The science program in the first grade with the hands-on packet was also excellent.*

—Parent

*Not enough parents get to see inquiry in action. The ones who see it say, "Wow!"*

—Third-grade teacher

Students used to proceed through science lessons with about the same enthusiasm they had for any of their other subjects. Now teachers report that for many students, science is their favorite subject. The children in Inglewood School often ask about upcoming units and when they see the kits arranged in the hallways, they read the boxes as they walk past them on the way to gym or the cafeteria. Students eagerly await the beginning of a new unit. They have heard from their friends and siblings in other grades about specific activities and cannot wait to become scientists and begin to discover new things for themselves.

*The kids see the kits lined up in the hallway. They get so excited. The kids love the paper kit.*

—Kindergarten teacher

Teachers and administrators could see from the inception of the science modules that students were more actively engaged in science. It was clear that as students had more hands-on opportunities they not only enjoyed science more, but this active participation also translated into gains in understanding and mastery of science content and process.

*They [teachers] wanted to spend all their time doing the kits, because their sense was they got more out of their efforts in terms of student learning.*

—Elementary science coordinator

Teachers saw the range of students they taught excelling and finding new interest in science. Several teachers reported that all students in their rooms had found success using the new curriculum.

*In the past you had to struggle to get children to understand the concepts that were presented in the science textbooks. They were also hard to incorporate in other subjects*

—Fifth-grade teacher

*I've noticed a lot more female involvement with science. They have been allowed to do it in small groups. They are more willing to take risks in small groups. Yeah, the sixth-grade girls; they just excel, such a difference.*

—Leader Teacher

*We love science.*

—Student

*Can we do this all day long?*

—Student

## Assessment

Although teachers clearly saw growth in science and a shift in students' attitude regarding science, creating assessment tools that generated an equal degree of enthusiasm was more of a challenge. As a consequence of adopting hands-on methods that emphasized group work and science process, teachers found it more difficult to measure changes in student learning using the more traditional techniques and assessments in place in the North Penn School District. Teachers struggled to find homework to assign to students that would reinforce the skills and concepts presented in class and involve parents in their children's learning. Teachers could see students building upon knowledge from previous years, but how could they provide evidence for such claims? How could teachers maintain high standards across all elementary schools and align the new modules with the philosophy of uniformity instituted throughout the North Penn School District?

Working with teachers in the North Penn School District, MISE helped teachers develop appropriate assessment strategies that would articulate with hands-on-based instruction. Study groups were formed in each of the four MISE districts composed of Leader Teachers. Several of these study groups focused

their efforts on developing not only a philosophy of assessing hands-on science, but concrete materials for teachers to use in their classrooms. A series of assessments and detailed strategies was outlined and compiled in binders for each school. Teachers often consult these binders to select appropriate measures of student performance and to gather ideas to adapt for their classrooms' particular needs.

Recently several PTWs have been designed around the issue of assessing students in science. The teachers in Inglewood School have responded positively to such offerings by attending summer workshops and then instituting several of the ideas discussed. One teacher described an idea she had in which she found a way to involve parents in the student assessment process. This teacher creates about four or five homework packages as her students learn about soil. She assembles soil in Baggies and creates a log in a journal in which students will write observations and facts about the soil. The students bring home the soil homework package and spend some time discussing the soil with an adult at home. After observing and discussing the soil, the child and adult record observations about the soil in the homework notebook. The package is then returned to school the following day so that another student can bring it home, read what previous students have written, and is able to record new information in the journal. The teacher said this idea has been developed more in recent years and she says she gets a positive reaction from all parents and students involved in this innovative approach to homework and assessment.

In Inglewood School in particular, several teachers have been more interested in developing formal assessments to be used with each science module. This interest has been an enormous undertaking to which MISE has responded quite positively. Besides instituting the assessment study groups and creating PTWs based on assessment, MISE recently funded teachers to attend week-long assessment workshops given by experts in the field. These teachers have returned from the workshops with several ideas about how to move to a deeper level of assessment and translate these ideas into everyday practices. These teachers have become both the instructional team members who lead PTWs focused on assessment and also leaders in their school and district in designing formal assessments for each module. Currently the teachers are in their second year of developing and field testing final assessments for each module. These final assessments were created by teachers in each grade level after dissecting each module and prioritizing both content and science process skills covered in each unit. The final assessments will be used by teachers to assess students' understanding and progress, ensure uniformity across the district, and help teachers design future lessons to ensure increased success for all students. Teachers use a summative assessment, which is a combination of both pencil-and-paper and performance-based activities to demonstrate the science content and process or skills that students have mastered in the course of a unit. Teachers at Inglewood School have moved beyond creating innovative homework assignments and designing rubrics and are now deep into creating assessment strategies for every science module.

> *We went to Oregon for a week for [week-long] assessment training. A whole new avenue opened up. We want to get to the next level of deep assessment.*
>
> —Sixth-grade teacher and Leader Teacher

*We are working on a final assessment for each kit now. We are in the second year now; it is a slow process, field testing and bringing results. We want to use it as a teaching tool to say, "This is what you've done, this is where you are."*

—Sixth-grade teacher and Leader Teacher

*Assessment? The past four years it has been really been ingrained and being used.*

—Fifth-grade teacher and Leader Teacher

## Impact on the School as a Whole

The unique partnership that has been cultivated over the past 10 years between MISE and Inglewood Elementary School has not only improved instruction within individual classrooms and rejuvenated enthusiasm about teaching science, but several other changes can be attributed to the partnership.

Ten years ago, teachers in Inglewood School felt very differently about their library and the resources it had to offer. When teachers were asked if they could use the library resources for science classes, they did not respond positively.

*We are needing resources for all levels. There is not enough they can use. It is all above their reading level. It's old and not inviting.*

—Leader Teacher

The current librarian at Inglewood School is a former teacher who attended several PTWs as a classroom teacher. She was trained in the use of inquiry-based methods and has worked with the teachers to compile resources that can be used to facilitate the new curriculum in their classes.

*Teachers come after PTWs to me. They have literature requests. They want research time.*

—Librarian

*The librarian has purchased so much science literature to go with the kit. So often we have age-appropriate literature for the kit.*

—Kindergarten teacher

Perhaps the most unique creations that came out of the partnership with MISE are the ISMAT team's science themes. Shortly after teachers returned from LTIs and were given the task of becoming "science leaders" in their school, the Inglewood Leader Teachers spearheaded the ISMAT team. During monthly meetings, the team designed a unique schoolwide science theme to be implemented in the spring of each year. Since then, the ISMAT team has adopted a theme each year and all members of the school have worked toward a common science goal. Bugs, water, rainforests, and inventions have been themes in past years. Throughout the year, the ISMAT team discusses appropriate learning goals for the students at the different grade levels, and then the school devotes an entire week to the theme, culminating in a museum walk. During the year, there are monthly ISMAT meetings where the team will collaborate with the teachers, helping them with ideas for working toward the goal and discussing the resources needed so that all can reach their goals. There have been additional after-school professional development opportunities sponsored by the ISMAT team which support the schoolwide theme. Although they are optional, teachers enthusiastically support the effort of a schoolwide goal in science and most of the staff attends the meetings. The science theme has been an effective way to involve all teachers, students, and parents in science. When teachers, parents, and administrators were interviewed, without exception they cited and

praised the yearly science themes. The Leader Teachers were instrumental in creating this innovative approach to schoolwide learning.

*Science days wouldn't have happened without Merck.*

—Librarian

When administrators talk about the partnership with MISE, they often discuss the effect it has had on creating more accessible curriculum for students in all subjects, not just science.

*Even our reading program has become more hands-on...I think it's the cycle of the curriculum, moving toward hands-on.*

—Superintendent

*Merck's stake was to improve science education. It's rubbed off into other areas. Improved learning and teaching in other areas.*

—Superintendent

*If the Merck Partnership were to end tomorrow, what will remain in place? Knowledge of teachers. New assessment techniques. Instruction changes. Whenever I get to MISE meetings, it's interesting how ingrained it is in our staff. That spills over into everything.*

—Superintendent

## MISE Perspectives

Without exception, everyone involved with the MISE Partnership in Inglewood School has seen it as the most influential and effective change in science education. Because of Merck's commitment to science education and the professional development of teachers, there has been steady progress throughout the school. Teachers have deepened their own content knowledge in science and pedagogy and have translated this deeper understanding to more effective classroom practices. Merck has proven itself to be an indispensable part of Inglewood School's science program and everyone has noted successes.

*I'm very grateful; it's a tremendous opportunity.*

—Curriculum coordinator, secondary math and sciences

*What has surprised you about the MISE Partnership? The people who've been in the profession for 25, 30 years, that they're willing to change practices, because it's made an effect on them.*

—Curriculum coordinator, secondary math and sciences

A shared commitment to improvement has been crucial to the success of the science reform in Inglewood Elementary School. By creating a partnership in which every participant had a stake, MISE ensured the success of innovations in instruction.

*We're all in it for the same reason. What could be better? It's wonderful.*

—Supervisor of mathematics

*It's focused a spotlight on science for elementary teachers; it has made science an equal partner.*

—Curriculum coordinator, secondary math and sciences

*Now that Merck has joined in a partnership with the district, it has been a tremendous help, not just with the money, but also the connection of the Merck name which evokes quality, excellence, and vast resources in science.*

—Superintendent

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# Appendix A. Usage of Science Modules in Partnership Districts

| Grade | Linden | North Penn | Rahway | Readington |
|---|---|---|---|---|
| K | Senses (Insights)<br>Balls and Ramps (Insights)<br>Animals 2x2 (FOSS)<br>Paper (FOSS) | Senses (Insights)<br>Living Things (Insights)<br>Paper (FOSS) | Animals 2x2 (FOSS)<br>Paper (FOSS)<br>Balls and Ramps (Insights)<br>Senses (Insights) | Senses (Insights)<br>Paper (FOSS)<br>Animals 2x2 (FOSS) |
| 1 | New Plants (FOSS)<br>Balance and Motion (FOSS)<br>Insects (FOSS)<br>Weather (STC) | Weather (STC)<br>The Life Cycle of Butterflies (STC)<br>Solids and Liquids (STC) | Solids and Liquids (FOSS)<br>Air and Weather (FOSS)<br>New Plants (FOSS)<br>Balance and Motion (FOSS) | Weather (STC)<br>Balls and Ramps (Insights)<br>From Seed to Plant (DSM) |
| 2 | Solids and Liquids (FOSS)<br>The Life Cycle of Butterflies (STC)<br>Balancing and Weighing (STC)<br>Soils (STC) | Organisms (STC)<br>Balancing and Weighing (STC)<br>Soils (STC)<br>Changes (STC) | Pebbles, Sand, and Silt (FOSS)<br>Insects (FOSS)<br>Balancing and Weighing (STC)<br>Investigating Objects in the Sky (BSCS) | Soils (STC)<br>The Life Cycle of Butterflies (STC)<br>Solids and Liquids (FOSS) |
| 3 | Structures of Life (FOSS)<br>Magnetism and Electricity (FOSS)<br>Earth Materials (FOSS)<br>Investigating Objects in the Sky (BSCS) | Electric Circuits (STC)<br>Chemical Tests (STC)<br>Animal Studies (STC)<br>Water (FOSS) | Magnetism and Electricity (FOSS)<br>Human Body (FOSS)<br>Water (FOSS) | Structures of Life (FOSS)<br>Physics of Sound (FOSS)<br>Earth Materials (FOSS)<br>Balance and Motion (STC) |
| 4 | Human Body (FOSS)<br>Physics of Sound (FOSS)<br>Land and Water (STC)<br>Investigating Ecosystems (BSCS) | Plant Growth and Development (STC)<br>Rocks and Minerals (STC)<br>Land and Water (STC)<br>Designing Structures (BSCS) | Earth Materials (FOSS)<br>Structures of Life (FOSS)<br>Physics of Sound (FOSS)<br>Investigating Ecosystems (BSCS) | Electric Circuits (STC)<br>Land and Water (STC)<br>Levers and Pulleys (FOSS)<br>Human Body (FOSS)<br>Water (FOSS) |
| 5 | Environments (FOSS)<br>Mixtures and Solutions (FOSS)<br>Solar Energy (FOSS)<br>Motion and Design (STC) | Microworlds (STC)<br>Ecosystems (STC)<br>Motion and Design (STC)<br>Investigating Weather Systems (BSCS) | Mixtures and Solutions (FOSS)<br>Environments (FOSS)<br>Motion and Design (STC) | Magnets and Motors (STC)<br>Mixtures and Solutions (FOSS)<br>Environments (FOSS)<br>Food and Nutrition (FOSS)<br>Oceans (DSM) |
| 6 | Diversity of Life (FOSS)<br>Weather and Water (FOSS)<br>Mirrors/Color Analyzers/ Refraction (Boston Science Museum/GEMS/local) | Magnets and Motors (STC)<br>Measuring Time (STC)<br>Solar Energy (FOSS)<br>Light and Color (Project Aries) | Diversity of Life (FOSS)<br>Weather and Water (FOSS)<br>Mirrors/Color Analyzers/ Refraction (Boston Science Museum/GEMS/local) | Experiments w/ Plants (STC)<br>Planetary Science (FOSS) |
| 7 | Populations and Ecosystems (FOSS)<br>Planetary Science (FOSS)<br>Energy, Machines, and Motion (STC) | | Populations and Ecosystems (FOSS)<br>Planetary Science (FOSS)<br>Energy, Machines, and Motion (STC) | |
| 8 | Environmental Issues (local)<br>Earth History (FOSS)<br>Properties of Matter (STC) | | Environmental Issues (local)<br>Earth History (FOSS)<br>Properties of Matter (STC) | |

*FOSS = Full Option Science System*
*STC = Science and Technology for Children*
*BSCS = Biology Sciences Curriculum Study*
*Insights = Insights: Inquiry-based Elementary School Science Curriculum*
*GEMS = Great Explorations in Math and Science*
*Project Aries = Astronomy Resources for Inter-curricular Elementary Science*
*DSM = Delta Science Modules*