

MISE Focus: Professional Development

For decades, educators and policy makers have been tinkering with a range of management, curriculum and testing initiatives to boost student performance. More recently, they have taken a different tack: improving professional development.



Philadelphia teachers assemble a structure in a workshop on experimental design.

Thanks to a growing body of research data, it is becoming clearer that designing and delivering high-quality professional development may be one of the most direct paths toward improving student learning.

Among the more compelling conclusions reached by researchers about the value of good teacher education are the following:

- ▶ Teacher expertise accounts for more variation in student achievement than any other school factor.
- ▶ Differences in teacher qualifications contribute to the large disparities in achieve-

ment between white and African American students.

- ▶ Teachers who hold a major in the discipline that they teach and who are well prepared have more success with students than teachers who are not.
- ▶ Teachers who spend more time studying their craft develop higher-order thinking skills and are better able to meet the needs of diverse students.

Despite these important findings, many districts are still not devoting the resources necessary to equip their teachers with the knowledge and skills they need to perform well. As proof, the National Commission on Teaching and America's Future (NCTAF) cites the continuing shortage of well-qualified teachers. The commission says 21 percent of all secondary teachers do not have even a minor in the subjects they teach. This problem is especially acute in the field of science, where chronic shortages have existed for more than 40 years.

NCTAF found that those teaching out of their fields taught 48 percent of high school students taking physical sciences.

These shortages, along with the research linking student performance to good teacher

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preparation, suggest reasons why test results for 12th grade science students placed the United States 16th out of the 21 countries in the Third International Mathematics and Science Study.

Although the case for quality professional development is now clear, how to accomplish it is not. Susan Loucks-Horsley, director of the National Institute for Science Education's Professional Development Project at WestEd, writes: "Although we know much about what constitutes 'best practice,' there is less guidance about how to design professional development so that it promotes continuous learning in the organization, is equitable for teachers and students, builds the leadership and infrastructure needed, fits with the school context and gives teachers the range of experiences they need to learn."

The Merck Institute for Science Education (MISE) is committed to improving science education through professional development that addresses these very concerns. Deepening teachers' knowledge and strengthening their expertise in how to relate that knowledge to students are the key goals of its professional development programs. For the last five years MISE has been refining the design and delivery of its major professional development efforts: the Leader Teacher Institute and the Peer Teacher Workshops. Both are supported by a grant from the National Science Foundation (NSF).

The Leader Teacher Institute is a three-year program focused on developing building-based teams of teachers capable of leading science reform in their schools. The Peer Teacher Workshops, one-week workshops for teachers in MISE's partnership districts, are designed to deepen teachers' content knowledge, as well as help them acquire better instructional skills, and are tied directly to the districts' science curricula. These efforts are supplemented by the Merck Fellows program, which pairs education students with classroom teachers. In addition, MISE works with the Penn-Merck Collaborative for the Enhancement of Science Education, also sponsored by

NSF. The collaborative brings together the resources of MISE, the University of Pennsylvania and the School District of Philadelphia to enhance the teaching and learning of science in Philadelphia's elementary and middle schools.

These efforts are informed by the thinking of such organizations as the National Institute for Science Education, the Consortium for Policy Research in Education, the Association for Supervision and Curriculum Development, the National Staff Development Council and others.

With attention to this collective wisdom, MISE has designed professional development programs characterized by the following:

- ▶ **Tailored to district needs.** MISE's programs are designed to meet the specific needs of the teachers and the district. At the beginning of the school year, districts conduct needs assessments that determine the content of the workshops. The workshops therefore become district and curriculum specific.
- ▶ **Standards- and assessment-based.** The content of the professional development is keyed to local, state and national standards. Facilitators imbed the standards in the workshop material and emphasize the importance of standards and assessment. Participants also explore methods for assessing how well students understand the content.
- ▶ **Inquiry-centered.** MISE's workshops are built around the science modules used in the participants' classrooms. There is little lecturing or demonstrating. Instead, participants assume the roles of students. They experiment, modeling the same process of scientific inquiry expected of their students. They ask questions, make predictions, devise plans to test their predictions, test the predictions and record findings. Through this process, they

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Merck Fellows Program

MISE Invests in Teacher Education

To be treated as peers. To understand the differences between theory and practice. To learn the importance of inquiry and have the opportunity to deepen content knowledge. These are some of the many benefits cited by Merck Fellows, participants in a teacher education program operated by MISE through partnerships with local colleges of education with the support of the National Science Foundation.

MISE invests in the development of these future teachers because it believes in the importance of strengthening their standards-based content knowledge and pedagogy. Carole Stearns, Ph.D., a former MISE staff member and creator of the Merck Fellows program, says few of the students come to the program exceeding the minimum certification requirements in science or mathematics.

This year, 18 students from Beaver College, Rutgers University and Kean University were chosen to be Merck Fellows. About half are graduate students entering teaching as a second career. The remainder are undergraduate candidates for certification.

Competition for the fellowships is stiff. Fellows are selected by MISE staff and faculty at the participating colleges on the basis of their academic record, letters of recommendation, demonstrated leadership qualities, personal statements and the capacity to contribute to and benefit from the program.

Merck Fellows attend the MISE summer workshops and have two field placements, before and after the programs, in the classrooms of Leader Teachers. At workshops this past summer, it was often difficult to tell the difference between Merck Fellows and practicing classroom teachers. The Fellows blended easily with their colleagues, asked thought-provoking questions and made important contributions to the sessions.

In a habitat workshop, for instance, Beaver College biology student Alyson Gloviak, who expects to teach science at the secondary level, sidled up to a computer screen and helped her teacher colleagues maneuver through a series of classroom resources, including videos and supportive text. “With the Peer Teacher Workshops,

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create their own knowledge, rather than just receive it. Such constructivist practices help convince teachers of the validity of this method of learning and help them achieve a deeper understanding of the material.

- ▶ **Designed to deepen content.** Those who do not know content cannot teach it. The MISE workshops offer multiple opportunities for participants to deepen their knowledge of a subject through inquiry-centered learning, and readings and research.
- ▶ **Peer-delivered.** MISE workshops are facilitated by a team that includes district teachers, MISE staff and specialists from higher education. When teachers plan and lead the workshops, it deepens their content knowledge, builds their schools’ capacity to deliver professional development and provides

workshop participants with a resource and a role model.

- ▶ **Long-term.** In too many districts, professional development is a short-term exercise that trains teachers to change a specific set of behaviors. MISE takes a much longer, more systemic view. Its shortest programs last a week and are the culmination of many months of planning sessions with partnership districts. The collaborative nature of these sessions—in and of itself—offers many professional development opportunities. MISE’s longer programs require teacher commitment for three years.

In this issue, *Explorer* takes an in-depth look at MISE programs that exemplify the critical elements of designing and delivering effective professional development. ◀

Merck Fellows

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I'm truly a peer," she says. "It's wonderful to be considered an equal."

Nicole Dudek, a Merck Fellow majoring in early childhood education at Beaver College, says that beyond seeing each other as equals, the Fellows and teachers view each other as resources. "They ask, 'What are you learning in your undergraduate classes?' or say, 'When I was in college it was different.' You can tell some of what we are learning is new to them. It makes me realize that what I'm learning in college is valuable."

The workshops and field placements give the Fellows sneak previews of what life will be like in their future profession. In an informal setting, they get the chance to share experiences with each other and to hear firsthand from practitioners the challenges and rewards of teaching, as well as the expectations, successes and failures.

"The most unique thing for me is to hear actual teacher dialogue, what they think is working, what they think about the content standards and how workable they are," Gloviak says. "It gives me a realistic perspective. I'm learning, for example, how difficult it is to meet all the standards in a short period of time."

Most of the Fellows appreciate the opportunities they have in the workshops to deepen content knowledge. Dudek says she learns a lot about methods and strategies as an undergraduate, but feels she doesn't have enough time to master the subject matter.

Administrators at the program's participating colleges acknowledge the problem. It is particularly true for math and the sciences, says Sharon Brendzel, a science educator at Kean. To major in math and science, students generally need more time in these subjects than the credit hours allowed in their schedule, requiring them to borrow from other liberal arts electives. "We just open the doors for the undergraduates—it's not quite enough," Brendzel says.

Anna Maria Schuhmann, dean of the school of education at Kean, says the workshops also give students a chance to refine teaching methods.



Jean Wallace (left) and Alyson Gloviak, Merck Fellows from Beaver College, observe the behavior of fiddler crabs.

"Elementary school teachers in New Jersey are limited to 30 credit hours in education, including all field work," she says. For most students, she and Brendzel agree, that's not enough time to develop the self-confidence needed to use inquiry effectively in the classroom.

Margarida Chenalloy, a Fellow from Kean University who is entering teaching as a second career, says the workshops have shown her how much methods have changed in presenting science and math material since she was an elementary school student. "I was flabbergasted by how students are learning to live math, as opposed to just processing it. Also, when I was a kid in science classes, we followed the steps of a recipe in a lab."

Overall, for many of the Fellows the experience is an affirmation of their desire to be teachers. "Last week when I went home I had this good feeling," Dudek says. "I told my parents I'm sure glad I'm doing this. I'm glad I know what I want to do, and I like being around people who love teaching and love kids." ◀



The Road Ahead for Professional Development

By Carlo Parravano, Ph.D.

Many educators now support the premise that well-qualified teachers are the single most important school factor in determining levels of student achievement. We agree. And so we ask: What makes a teacher well qualified?

Good teachers have a strong foundation in the disciplines they teach. They understand how children learn and are schooled in effective methods of teaching. And, according to a Harvard study cited in a recent issue of the Education Trust's newsletter, *Thinking K-16*, the most effective teachers have strong verbal and math skills.

At MISE, we work with many such teachers in our partner schools, but even the most experienced and successful among them have expressed a continuing need to deepen and update their knowledge—especially in the sciences. Others have acknowledged serious deficits in their science preparation and the desire to improve their skills. All—veteran and novice alike—recognize that high-quality, ongoing professional development is key to their growth as teachers.

In their book *A New Vision for Staff Development*, Dennis Sparks and Stephanie Hirsch of the National Staff Development Council have encouraging words for schools.

Hirsch and Sparks say that the future for professional development looks good, in part because of the events of the past few years. In that time, governmental bodies, business groups, various high-profile commissions and others have taken closer looks at staff development and have concluded that it must play a central role in school reform efforts. Also they have noted that professional development must be deep, sustained and high quality. Otherwise, these experts say, students will never perform at expected high levels.

“At the same time, however, more people are realizing that this professional development ... must be considerably different than that offered in

the past,” Hirsch and Sparks write. “Soon to be gone forever, we hope, are the days when educators (usually teachers) sit relatively passively while an ‘expert’ exposes them to new ideas or ‘trains’ them in new practices, and the success of the effort is judged by a ‘happiness quotient’ that measures participants’ satisfaction with the experience and their off-the-cuff assessment regarding its usefulness.”

Sparks and Hirsch contend that a paradigm shift is taking place in the field of staff development. The major educational changes that are taking place in classrooms, schools and district offices are, in turn, influencing the professional development that supports these changes.

A growing body of knowledge is available on what constitutes good professional development, and a number of prominent national education organizations have published their findings and have informed our work. At MISE, we design professional development programs within a framework of essential elements. We believe that high-quality professional development should do the following:

- ▶ strengthen teachers’ content knowledge and pedagogical skills—and integrate the two;
- ▶ be grounded in the districts’ actual curricula;
- ▶ engage teachers intellectually;
- ▶ reflect the best and most up-to-date research;
- ▶ provide sufficient time for inquiry and reflection;
- ▶ be teacher-designed and site-based, and provide sustained engagement;
- ▶ recognize students’ diverse learning styles and backgrounds;
- ▶ provide on-site support to teachers as they integrate new knowledge and skills into their classroom practice;

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MISE Workshops: Where Teachers Become Students

The classrooms are noisy and filled with activity. In one room, students are adding weights to four-wheeled models they've assembled and are experimenting with the concepts of friction and motion and their relationship to mass.

Timekeepers fidgeting with stopwatches observe the vehicles as they roll across a table. They call out the seconds at the end of each experiment, stop the watches as the participants add more mass, and repeat the process. Each of the participants records the results and then graphs them for others in the class.

In another room, the students are altering the habitats they have constructed for fiddler crabs and snails and observing their reactions. One student notes that the crabs spend very little time in the water. Another experiments with different sands to see if it makes any difference in the crabs' movements and decides that they are territorial. A third describes "frisky" behavior in her snails and believes they are preparing to mate.

In a classroom across the hall, students are pouring water onto stream tables they have constructed of humus, sand and clay to simulate the effects of water runoff and erosion. They also are examining the porosity of soil substances and recording the results.

In still other classrooms, students are experimenting with paper construction and the digestive system. They are recording observations in journals, giving oral presentations and developing rubrics to assess the presentations.

Rubrics? Assessment? That's right, because the students in these classrooms are elementary and middle school teachers from Pennsylvania and New Jersey who are participating in professional development workshops. They are conducting investigations with the same standards-based science modules—often called science kits—that their students will work with in the coming school year. As a result, the teachers hope to deepen their knowledge about the content, as well as develop stronger foundations in pedagogy.



Joanne Ferrara, a kindergarten teacher from School #4 in Linden, examines the fruits of her labor in a paper-making workshop.

Planning for the MISE summer workshops described here began nine months earlier, when 700 teachers from MISE's partner districts—Linden, Rahway and Readington Township in New Jersey, and North Penn in Pennsylvania—were asked to document their needs in science education. "Every district collected huge amounts of data from teachers of all grade levels and turned the information into course offerings," says Susan Elko, MISE's manager of professional development programs. In most cases, the teachers asked for help with the specific science curriculum, or modules, they teach at their grade level.

In February, when it was clear who would be participating in the workshops, about 50 members of instructional teams—including teachers who had attended MISE's Leader Teacher Institute and content specialists from MISE, universities and elsewhere—met for a three-day retreat in Princeton, N.J.

The retreat was unique in its purpose and execution. It was both a planning session for the upcoming workshops and the first piece of professional development for the teacher participants on the instructional teams.

Participants in the retreat created a series of questions to use in planning the workshops.

One set of questions required the planners to consider their audience. Who would the participants in the workshops be, and what needs and expectations would they have? How many years had they taught at their current grade level, and how many years had they taught the current curriculum?

They considered the learning goals of the instructional materials. How would the learning goals reflect the districts' frameworks and the local, state and national standards? And how would the learning goals be assessed?

How would the workshops help teachers confront the important issue of equity in learning? How would they provide opportunities for teachers to engage students with different learning styles, so that science truly could become accessible to all students?

The discussion generated by the questions helped retreat participants plot out the materials and resources they would need to conduct the investigations called for in the modules. What readings, technology and resource materials would they use to supplement the modules?

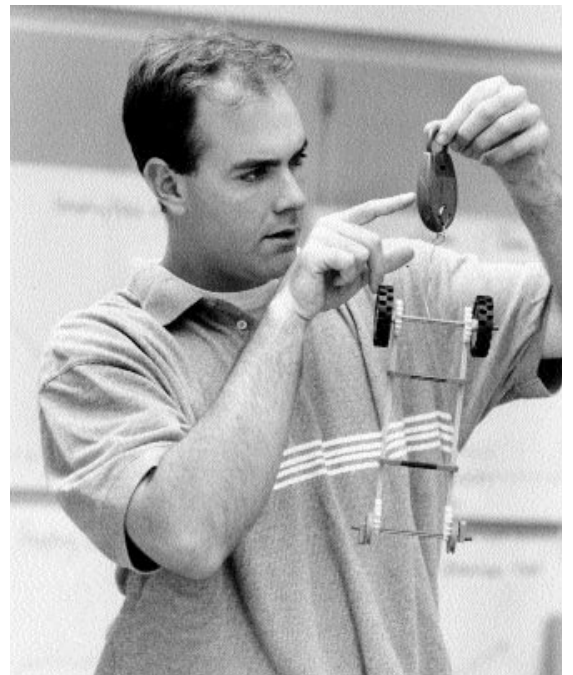
Finally, this format helped ensure that the workshops allowed time to consider how to address such issues as parental involvement and infusion of math principles. They also would need time to integrate the science lessons with other disciplines, such as language arts.

In the months ahead, the instructional teams met separately and worked with their modules. They looked for opportunities to address the questions they had formulated at the retreat.

“Teachers were hesitant to work with their hands. This has given them the confidence to get away from the textbook as a security blanket.”

Jim Gill, a middle school teacher and member of the land and water instructional team, says his team had five planning sessions. “Basically they became focused brainstorming sessions. We talked about which lessons lent themselves to . . . assessments. We actually ran the stream table trials and analyzed the lessons. Then we made some adjustments.”

Maren Reeder, MISE’s manager of education outreach, says the teachers learned during the planning sessions how to become facilitators, even as they deepened their content knowledge. “A lot of coaching occurred on how you bring



Casey Scullin, a 5th grade teacher from Hatfield Elementary School in North Penn, takes measurements on a four-wheeled vehicle in a workshop on mass, motion and friction.

information back to your colleagues, as well as on the science content and how the concepts relate to the standards,” she says.

Deborah Pomeroy, coordinator of science education at Beaver College and a content specialist on one of the instructional teams, says the amount of time invested was disconcerting to some. But she says the outcome justified the effort. By the time the workshops began, she says, the teachers on the instructional teams had

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MISE Workshops

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become comfortable with the material. Just as important, most had gained confidence in facilitating workshops with fellow teachers, which for some was a considerable obstacle.

“It’s sometimes unnerving to get in front of your colleagues knowing that you do the same thing they do,” acknowledges Curt Doll, a Leader Teacher who has worked on two instructional teams as a facilitator. “I always get uneasy about doing it,” Gill agrees. “You approach the task with fear and trepidation.”

The trepidation was not apparent in the actual workshops. Most workshops included a minimum of presenting and no effort to distinguish the content specialists from the Leader Teachers and the teacher participants. After the instructional teams posed the challenge, the participants broke up into smaller groups and engaged in lengthy experiments designed to be intellectually stimulating. Members of the instructional teams melted into the groups, observing, questioning, offering helpful hints or focusing the attention of the participants on a new insight emerging from a particular group.

These kinds of workshops are valuable for a number of reasons. First, working extensively with the kits over a period of days allows teachers to get deeper into the content and develop their powers of observation. Nicasia Anzalone is a 3rd grade teacher in the North Penn School District, near Philadelphia. As she peered through a magnifying glass at a snail, she exclaimed, “In the two years I’ve taught this kit, I’ve never seen the mouths on these things.”

Second, role reversal, from teacher to student, is an important goal of the workshops. “It puts us in the place of the learner and allows us to get a better perspective on what they are feeling,” explains Angela Simeon, a 3rd grade teacher in North Penn. “We actually model what we will do with the kids and how we will teach the subjects,” adds Valerie Wagenhoffer, a 4th grade teacher in Rahway, N.J. “So it’s not just content. You come away with strategies you can use.”



Margarida Chenalloy, a Merck Fellow from Kean University, left, and Kathy Frees, a 4th grade teacher from School #1 in Linden, prepare soil samples for experiments with porosity in a Linden, N.J., workshop.

Third, because they ordinarily work in isolated environments, many teachers appreciate the opportunity to share knowledge and experiences with other teachers. “When you get teachers like this group who are close in grade levels, they can discuss problems, share and come up with solutions,” says Lois Eckelman, an instructional team member from Rahway.

Good professional development should register change in instructional practice and ultimately improvement in student achievement. Many say they are seeing such results in MISE partnership districts.

“The only hands-on experiment I remember when I was in school was putting celery in water and watching food color go up the stem,” says Sue Maughan, a 3rd grade teacher in Rahway. “And now science is very different. In the classroom, students are talking about it, writing about it *and* having fun. Kids ask me, ‘Are we doing science today?’”



North Penn District teachers Tracy Suchodolski, left, of Montgomery Elementary School, and Gail Garner, of General Nash Elementary School, measure the effect of friction on the movement of a cement block.

Rahway Superintendent William Petrino concurs. “I’ve seen many classrooms change from quiet as a church to lots of movement. It’s not random chaos; it’s kids actively engaged in learning.”

Petrino attributes the changes in part to the design of the workshops. “This is very different from other professional development workshops. Teachers are very actively involved. They operate the way we would like to see the classrooms operate. As opposed to a lecture environment, we really get into inquiry-based learning.

“For the most part what teachers say is they were hesitant to work with their hands before because they were not comfortable with the content or the process. This has given them the confidence to get away from the textbook as a security blanket. Any teacher who goes through these workshops comes out of it with a sense of how classrooms should work.” ◀

The Evolution of a Leader Teacher

Involving Leader Teachers in the design and facilitation of MISE’s summer workshops marks a new level of development for this group of talented and committed individuals.

Leader Teachers are educators who have developed their skills during three years of participation in MISE’s Leader Teacher Institute. In the two years since the institute ended its formal instruction, some have assumed new roles as instructors of their peers.

Pam Haynie, a 4th grade teacher in the North Penn district, says MISE’s investment in her development has completely changed her professional life. “It has changed my whole approach to teaching, not just in science, but in every area. It has pushed me more toward a role of leadership in my school.”

Haynie, like most of the Leader Teachers, believes her colleagues now regard her as a

resource—for designing lessons, for identifying speakers and for planning field trips. She also has participated in the creation of the district’s frameworks and assessments. “It’s given me a whole new awareness of how curriculum is designed and how change occurs at the systemic level,” she adds.

In his building in North Penn, Curt Doll and several other Leader Teacher colleagues have coordinated a science day for the last three years. And as a teacher, Doll says, his knowledge has exploded. “In my classroom, I always did experiments, but the experiments were all teacher-centered. I’d stand in front of the class and say, ‘Do this, this and this.’ Now I say, ‘Here are the materials, here is what we are trying to find out.’ My role is to help the students get where they want to go.” ◀

Penn-Merck Collaborative

A Three-Way Partnership to Improve K–8 Science Education

In a growing number of communities, school districts are partnering with higher education institutions and the business community to improve the resources dedicated to the professional development of teachers. The Penn-Merck Collaborative for the Enhancement of Science Education in Philadelphia is one such initiative.

The collaborative, now in its sixth year, has evolved from a science education program for elementary school teachers to a program for grades 5 through 8. Supported by a \$1.8 million grant from the National Science Foundation, the collaborative includes the following partners: the School District of Philadelphia, MISE, and the University of Pennsylvania's Graduate School of Education, School of Engineering and Applied Science, and School of Veterinary Medicine.

The program's goals are threefold. First, it seeks to improve the teaching of science through the development of teacher leaders, who can become mentors and catalysts for change in their schools. Second, it seeks to develop integrated, cross-disciplinary curricula in science and language arts. And third, it encourages female and minority students to pursue science as a field of study and a career objective.

Teachers from schools in Philadelphia's southwest neighborhoods are working in the program. They participate in two three-week summer institutes. The collaborative also requires participation in a series of continuing education seminars during the school year.

"You can get teachers jazzed up in the summer, but if you don't give them the support they need during the school year, they typically lose their momentum, and by the end of the spring they are almost back where they started," says Jane Horwitz, the program's coordinator.

During workshops this summer, 35 teachers worked with a selection of exemplary science curriculum materials, including FOSS, STC and INSIGHTS. They explored such topics as experi-



Teachers, assisted by engineering students from the University of Pennsylvania, assemble the components of a "humdinger."

mental design; energy, force and motion; and properties of matter.

In one group, teachers assembled gravity wheels out of paper plates, wooden axles, cups and washers to demonstrate principles related to gravity and motion. In another group, teachers were asked to build a "humdinger," a structure that made a humming and dinging sound when activated by a string.

Some teachers worked with Legos to assemble a complex conveyor belt. Under the guidance of William Graham, Ph.D., a professor of materials science at the University of Pennsylvania, and two undergraduate engineering students who are considering careers in education, the teachers used Lego kits to better understand gear ratios and converting circular motion to linear motion. Graham says he uses the same Lego systems with his undergraduates.

Chris Taranta, a master teacher leading a workshop on gravity and motion, says, "The field



Philadelphia teachers Yahya Muhammad (left) and Maureen Linton load weights onto gravity wheels made from paper plates.

of science education has undergone a paradigm shift away from traditional teacher-centered classrooms to student-centered ones. While this approach has been stressed for many decades now, it involves a lot of time and preparation

and in some ways is a more difficult system to implement.

Thus there is a great need for a program such as the Penn-Merck Collaborative to provide teachers with the experience and skills to be successful using such a strategy.

“The activities in this program are student-centered, designed to place the learning focus on the students themselves,” Taranta says. “One of

the goals of this type of teaching is to inspire students to come up with questions and pursue the answers to them. Personally, I love when students ask questions I don’t know the answer to. It is evidence of their positive interaction with the materials and the scientific ideas these materials explore.”

“The activities in this program are student-centered, designed to place the learning focus on the students themselves.”

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- ▶ recognize the importance of developing teacher leadership; and
- ▶ be designed with the ultimate goal in mind: to improve student learning.

In the next decade, 2 million new teachers will be hired in American schools to take the place of those who are retiring or leaving the classroom for some other reason. That’s an unprecedented number. The change will create new opportunities to build (1) stronger teacher education programs and (2) more effective professional development programs. Both are critical.

If we seize upon these opportunities, all children will have access to a high-quality science education. That’s the goal, and it’s one well worth the investment.

WGBH Produces Professional Development Videos

Inquiry-based teaching is considered one of the most effective means for deepening students' understanding of science, yet there are few tools available for teachers seeking to understand the concepts behind this valuable strategy.

A new series of videotapes produced by WGBH Educational Foundation called *Investigating Classrooms* provides concrete examples of teachers using inquiry-based methods in their classrooms. The library of nine videotapes, funded by the National Science Foundation, follows days or weeks of science instruction in three classrooms around the country: a 1st grade class in Boynton Beach, Fla., a 4th grade class in Castro Valley, Calif., and a 5th grade class in Huntsville, Ala. Each of the three classroom tapes is paired with a discussion video in which educators comment and reflect on the teaching shown in the tapes. Another tape demonstrates how the

library can be used as a professional development tool.

Susan Elko, MISE's manager of professional development programs, participated in the production of the videos. She says the tapes are not intended as models for inquiry-based learning. Rather, she says, they are presented as vehicles for teachers to analyze and discuss how inquiry can be used in the classroom.

The library also includes a 30-minute program called "Parents' Open House." It features experts who describe how to keep parents, community groups and administrators informed about important trends in science education reform, and the need for high-quality science instruction, especially inquiry-based instruction.

For further information, please visit the WGBH Web site at www.wgbh.org. ◀



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About the Merck Institute
for Science Education

The Merck Institute for Science Education was established in 1993 with a long-term commitment by Merck & Co. Inc. to improve science teaching and learning in the public schools. MISE's work with its partner school districts is supported also by a five-year grant from the National Science Foundation.