Catching a Tiger By the Tail: The Story of ASSET

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ASSET (Achieving Student Success through Excellence in Teaching), Inc. is an independent nonprofit organization in Pittsburgh dedicated to continuously improving teacher competencies —and student performance—with an initial focus on K–8 science and technology education. ASSET got its start in 1992 when the Bayer Corporation convened a group of partners, including other corporations, universities, community leaders, and educators. The group's task was to develop a program to improve science education in its communities across the country. Bayer's motivation came from "enlightened self-interest," i.e., they wanted to have a positive impact in their local communities and improve their own future workforce.

The partners decided to focus their efforts on elementary science education and to shape the work around the National Science Resource Center's essential components of exemplary science instruction (discussed later in this case study). They began the process through a competition among the 12 school districts surrounding the Bayer Headquarters in Pennsylvania, selecting two for the pilot program funded by Bayer. In 1994, when ASSET, Inc. was incorporated as a non-profit organization, the members of the original group became the board of directors, many of whom still serve in that capacity.

When the National Science Foundation Local Systemic Change (LSC) solicitation was announced in 1994, ASSET was poised to apply because the vision of ASSET's founders and the requirements of the Local Systemic Change (LSC) design had incredible overlap. With help from Bayer and others on the board of directors, ASSET submitted a proposal, and in 1995 received to expand the program beyond the initial two pilot districts. Gaining commitments from school districts to participate in the LSC was not hard, although encouraging districts and teachers to consent to the required 100 hours of professional development was more of a challenge. Even so, we successfully launched the LSC effort in 1995, and have been expanding and "scaling up" ever since. When the LSC grant ended, we went to a fee-for-service structure, and the number of districts we served grew.

A major milestone in scaling up ASSET's science education reform efforts came in July 2006, when Governor Edward G. Rendell and the Pennsylvania legislature approved an allocation of $10 million to expand the program across the state. Called *Science: It's Elementary*, the program is designed to serve 75 schools in 68 school districts in 35 counties across the state in its first year, providing curriculum materials and three-day professional development sessions to 1,400 teachers in 2006–07. The governor intends to continue to grow the program over the next five years until all 501 school districts in the state have the opportunity to participate.

In the *Science: It's Elementary* initiative, we are using a somewhat more prescriptive approach than we used during the LSC and fee-for-service years. We are being more deliberate, partly of necessity—it seems the best approach to managing such a rapid scale-up of our work. At the same time, we are building on what we have learned. We see this new initiative as an opportunity to provide a program that has improved steadily over the past ten years.

ASSET's initial work under the LSC is described below, with particular attention to the challenges that were faced and aspects of the project that were important to the scaling up effort. A later section provides more information on the current *Science: It's Elementary* program and how the approach has changed under this state initiative.

Description of Participating Districts

ASSET went from 2 pilot districts to 16 when the LSC grant was implemented. We did not recruit these districts; they expressed interest in participating after hearing of our work in the pilot districts. Later, another 14 districts wanted to be part of the project, so we requested and received a supplemental grant from the National Science Foundation to add these districts, bringing the total to 30 participating districts, all from Allegheny County (the area surrounding Pittsburgh.) ASSET provided materials and professional development to teachers of science in grades K–6 in these districts. Inquiry-based science modules—including units from Full Option Science System (FOSS), Science and Technology for Children (STC), Insights, and Science Education for Public Understanding Program (SEPUP)—formed the basic framework of the science curriculum materials available through ASSET.

When the LSC grant ended in 2001, we opened up the program to other districts through a fee-for-service structure. During the next few years, we expanded the program to include Grades 7 and 8, grew from 30 districts to 48, and added a number of private, parochial, and charter schools. ASSET now serves 80 percent of school districts in Allegheny County and four districts in surrounding counties, involving approximately 3,000 K–8 teachers. These schools range considerably in size, socioeconomic status, and student performance. Five of the member school districts have been on the state "empowerment list," receiving special attention, funding, and control from the Pennsylvania Department of Education.

Project Components

ASSET's theory of action focuses on developing and supporting classroom teachers by supplying them with the materials and professional development they need to teach in a standards-based way. From the beginning, our approach has been to offer the materials and professional development to districts and leave it to them to select from the available resources to suit their needs. The major resources and supports that have been offered by ASSET over the years (both under the LSC and beyond) are:

- *Science modules*, or "kits" are available to the districts through a Materials Support Center. Districts rent the materials from ASSET on a quarterly or trimester basis, and we deliver and later refurbish the kits for future use.

- *Module-specific courses* are six-hour sessions in which teachers become familiar with the mechanics and activities of the modules.

- *One-day courses* cover content and pedagogy that cut across the various science modules. For instance, the Introduction to Inquiry course introduces teachers to the concept of inquiry and the different learning cycles that the modules incorporate. Another course is on science notebooking.

- *Content and pedagogy institutes* are professional development experiences of two to five days. The institutes sometimes take place at a university in cooperation with a university partner, and cover specific content strands that are connected to the science modules, drawn from the physical, life, and earth sciences. They may also address pedagogical issues, such as inquiry-based instruction and use of technology. Pedagogical institutes include the Institute for Inquiry, Institute for Assessment, Institute for Technology, Foundations for Teaching Inquiry Math, Science and Literacy Institute, and the National Board Certification Institute.

- *ASSET Resource Teachers (ARTs)* provide mentoring, coaching, demonstration lessons, and curriculum consulting as requested by districts. They also provide follow-up support to teachers, and facilitate study groups.

- *Conferences* provide opportunities for networking; these include the ASSET Leadership Conference, Teachers' Inquiry Conference, and Administrators' Conference.

Key Aspects of the ASSET Model

This section highlights some of the components and approaches ASSET has used that have been instrumental in the scaling up effort. Although some of these features are unique to ASSET, or shared by only a few LSCs, such as the use of a business model, many of these features are typical of LSC models in general. For example, ASSET work has focused on the National Sciences Resource Center's essential components for exemplary science programs: high-quality professional development, quality hands-on materials, centralized materials support, assessment, and administrative and community support. Among these components, professional development and quality materials supply have been especially important services for the member school districts. Additional key aspects of ASSET's work have been teacher leaders, networking across districts, and heavy involvement of external partners.

Business Model

The ASSET approach is different from that of most LSCs in that a business model has been used from the beginning to bring about gradual, customer-focused, standards-based classroom improvement. ASSET offers programs and services to school districts and they choose what they want. Typically, teachers participate in module-specific training first, then proceed to Introduction to Inquiry or Science Notebook courses. By the time they are teaching two or three modules, i.e., in the second or third year of membership, teachers become more curious about the pedagogy and may sign up for multi-day institutes. Even so, other than module training, which is driven by module orders to the Materials Support Center, ASSET has not advocated any particular sequence in professional development. Rather, ASSET believes in providing multiple

entry points and a variety of appropriate professional development opportunities, so teachers can select the sessions they are interested in pursuing. In fact, ASSET never really considered any approach other than this customer-driven model, and has never been very directive with school districts. Pennsylvania is a local-control state, so dictating curriculum was not a viable option; rather, district leaders made clear that they expected some choice and that they wanted ASSET to be flexible.

Looking back at the process of going to scale, we realize that the LSC enabled ASSET staff to identify what teachers need to learn to be able to revise their instructional practice toward a more standards-based approach. Knowing their needs, we were able to restructure our relationship with the school districts to a member-driven fee structure. Over the years, the school districts had paid an increasing proportion of the materials fee, with local foundations and the National Science Foundation LSC grant covering costs for professional development.

When the LSC grant ended in 2001—and based on discussions with district liaisons and a thorough cost analysis—ASSET established a price list for members and nonmembers, with members receiving a substantial discount. Under this structure, when school districts pay for professional development in advance, ASSET issues coupons for the number of prepaid sessions, which are redeemed when teachers register for a course or institute. Interestingly, ASSET's growth began right after the transition to a fee-for-service; the original 30 districts remained as members, and over the course of the next five years, an additional 18 districts and private and charter schools joined as members.

The most significant lesson staff members learned was that ASSET has products and services to offer that school districts need as they adjust to a standards-based and accountability environment. As a result, ASSET veered away from being grant-driven to a business model that is customer and product driven. In other words, if ASSET does not provide what school districts and teachers need and want, it will change its products and services or it will cease to exist. This business model provides a great deal of strength and security and has set the stage for ASSET's growth across the state.

Some may question ASSET's decision to *not* mandate a particular sequence and to *not* monitor curriculum implementation—which we do not do. It is true that some districts to this day do not implement the materials and professional development plan as they were intended. However we believe that as a fee-for-service organization, we need to continue to assist districts in realizing the value of their membership investment so that we keep our customers and continue to nurture improvement. Ultimately, it is the responsibility of principals and central office personnel to ensure that the materials are being used and that students are performing to the best of their potential. We have not notified individual districts regarding the lack of use of materials when they come back to the Materials Support Center, but we do report the global numbers to the cross-district team members, hoping that they will be able to follow up within their schools. As an independent entity, ASSET has chosen to *not* pressure districts and schools, but rather to support teachers who seek assistance.

NSRC Components Provide Focus

A critical aspect of ASSET's approach is that, from the beginning, work has focused around the five essential components for exemplary science programs identified by the National Science Resources Center (NSRC): quality hands-on materials, ongoing professional development, centralized materials support, assessment, and administrative and community support. The focus on the five components drives everything we do.

From its inception, ASSET has provided opportunities for teams from each school district to participate in the NSRC's six-day Strategic Planning Institute to learn about the components of the model and to understand that this is a national program. Initially with Bayer and then with NSF funding, ASSET sent teams representing each school district to the Institutes. While there, the teams developed five-year strategic plans that allowed them to implement the hands-on materials and to plan for participation in professional development suited to their district context. Thus, actual implementation of programs and practices was different for each of the 30 participating school districts.

In 1993, when the first team representing the two pilot school districts attended the National Science Resources Center's Elementary Science Leadership Institute, the team became known for its lively behavior. At the end of the Institute, a school principal on the team stood up and announced to the entire Institute, "We obviously don't take ourselves very seriously, but we take our task very seriously, and we are going to do this in Allegheny County." Colleagues/partners from across the country have watched in awe as this group, now represented by ASSET, has grown steadily and was given the opportunity this year to expand across Pennsylvania.

High Quality Professional Development

High quality professional development is at the center of all of the LSC projects, and ASSET learned early on of the importance of this feature of science reform. Our initial plan had not been centered around professional development. In fact, in 1993 when Bayer started the program, the assumption was that the heart of the program would be the science materials. Bayer officials and others in the consortium anticipated getting science kits into classrooms, providing teachers with some training, and then we would be finished. It was during the LSC that we learned how much more the teachers needed to learn and that they needed an on-going support system. We realized that there was no entity out there that would help teachers continuously learn and grow.

The early emphasis on materials was appropriate, but when we received the LSC grant in 1995 and worked with it for six years, we shifted our thinking to include the importance of professional development. Teachers need the materials, but it is the high quality, consistent professional development that really makes the change in the classroom. American schools were set up in an industrial model, with an assembly line mentality of bringing in the students, delivering instruction, then letting them go. That model does not work anymore. Teachers can't just "deliver" instruction; they are held accountable for student achievement, so they need to be actively thinking about how well students are learning. This means teachers must learn the subject matter well enough to teach it through good questioning strategies and not do students' thinking for them. That is a major shift that can only be learned through ongoing professional

development that builds teacher confidence to step back and enable students to learn. ASSET believes that by improving teaching, student learning will improve.

Based on these beliefs, ASSET professional development covers a range of topics beyond introductory module and content training, including inquiry, technology, assessment, environment and ecology, science notebooks, science and literacy, and science and mathematics integration. The five-day Institute for Inquiry has been redesigned, with the work spread over a semester so that teachers are able to learn an aspect of inquiry, try it in their classrooms, and come back to reflect and share. Then teachers design an inquiry lesson, implement it, and on the last day of the institute, share experiences of how that inquiry lesson worked with their students.

ASSET professional development has clearly-articulated principles to maintain high quality. Professional development is open to both member districts and to nonmembers, who have a different fee structure based on the particular services they request. Most sessions take place at ASSET, where there are four fully-equipped training rooms, but sessions are also held at school district and partner locations at various times throughout the year.

In addition to purchasing formal professional development sessions, school districts can pay a fee that allows them access to ASSET Resource Teachers. The resource teachers can be called upon to provide mentoring, coaching, demonstration lessons, and curriculum consulting, as well as follow-up sessions with teachers as they revise their lessons to become more inquiry-oriented and/or to integrate technology tools more appropriately.

Materials Support

As noted above, materials were initially at the heart of the ASSET approach, and science materials continue to be a centerpiece of our work. ASSET provides schools with inquiry-based science modules that include everything teachers and students need for eight-to-twelve weeks of hands-on science instruction on a single topic. Member districts do not purchase the science modules; rather, ASSET has a 27,000 square-foot distribution and refurbishment center, and the districts rent the materials from us. We have nearly 6,000 kits, and districts provide us with their orders in April so we know what districts will need for the coming year. In August we make the first shipment; 8–12 weeks later those same kits come back and are refurbished for the next shipment. This full-fledged refurbishment center runs like a manufacturing operation, with a business person rather than an educator managing the center. We believe that offering this service to districts supports their effort to implement hands-on, inquiry-based science by saving districts and teachers the additional time and expense of refurbishing and circulating the kits. In addition, the materials provide inroads for offering the kinds of professional development teachers need to implement this kind of science instruction.

Teacher Leaders

The use of teacher leaders has been a key strategy for ASSET since the LSC was instituted. During the LSC, we created the position of ASSET Resource Teachers (ARTs) to design and deliver professional development and to coach teachers. We began with one ASSET Resource Teacher; we currently have four full-time and two part-time ASSET Resources Teachers on our permanent staff, as well as eight teachers on loan from their school districts for a two-year period. Our goal is to have one ASSET resource teacher to support 250 classroom teachers. In

addition to conducting all of ASSET's professional development (over 200 sessions per year not including the *Science: It's Elementary* program), ARTs coach and mentor lead teachers, provide demonstration lessons, facilitate study groups, conduct grade-specific think-tank sessions, and offer consulting services mostly around curriculum and standards alignment. They perform these services at the request of school districts and for a fee. When districts loan teachers to ASSET for this position, we reimburse the school district for the permanent substitute/ replacement teacher up to a cap of $45,000. We also waive the resource teacher and teacher leader development fees ($2,000–$15,000 depending on district size) for these districts.

In order to continue their own professional development, ARTs attend and present at state and national conferences, such as the annual convention of the National Science Teachers Association. Their learning is shared with the ASSET staff and with their peers when they return to their school districts.

ASSET also started a Teacher Leader Development program three years ago, and that has increased awareness of the value of teacher learning. A major focus has been on developing lead teachers into "Kit Specialists," who will be able to conduct (or co-conduct with a content specialist) module-specific training, both for ASSET members and for *Science: It's Elementary.* With the added benefit of being able to provide substitute reimbursements through the *Science: It's Elementary* program, districts are supporting the release of teachers to assist us. Over time, then, ASSET has essentially developed a career ladder for teachers from classroom teachers, to lead teachers in each building, to kit specialists, to master teachers and full-time ASSET Resource Teachers.

Cross-District Networking

Networking is one of the features of ASSET that has been important in building a culture of professional learning and in scaling up the reform. The benefits of networking are so subtle that it is difficult to quantify. In the LSC proposal, one of our goals was to break down the barriers between school districts, between teachers and administrators, and between industry and education. That has been a subtle motif at ASSET from the beginning.

During the LSC, we established a system of district liaisons called SOS (Support on Site) team members who are appointed by school districts. We meet with SOS representatives four times per year. That process has established a collaborative, cross-district support network that has become stronger each year. The SOS is responsible for ensuring that appropriate materials are ordered in April for the following school year, and that during the year their teachers participate in appropriate professional development sessions based on teachers' needs and the number of pre-paid sessions to which they have committed.

Networking with colleagues has been a wonderful learning opportunity for SOS team members. Many team members have now known each other for 12 years, and SOS meetings (as well as other ASSET events) have taken on the quality of a family reunion. The SOS meetings are more than simply congenial; participants are not talking about their families and vacation plans. Instead, they are talking about science and science instruction. There is great information sharing, and participants learn from one another about professional development and curriculum

realignment possibilities. They support each other's efforts, a level of collaboration that would not exist if not for ASSET bringing them together.

Cross-district networking also occurs among teachers through centralized professional development courses and institutes, helping to overcome the feelings of isolation experienced by many teachers. Networking teachers from 48 school districts enriches the professional development experience. It also helps teachers realize both what is unique to their districts, and what are the common issues and challenges. We now have teacher leaders from resource-poor districts teaching teachers in wealthier districts. The networking has been a wonderful "leveler."

External Partners

The fact that ASSET developed out of a partnership among corporations, educational entities, and other organizations—and has continued the partnerships to this day—has been vital to our work. The role of Bayer was, of course, instrumental in launching and maintaining the effort. The original group that eventually became the ASSET board held its first meetings at Bayer's off-site mansion, Baywood, on Saturday mornings, where the chef served a wonderful breakfast, including fried bananas. The group dubbed itself the "fried bananas bunch." Since then, Bayer has hosted or assisted in many of ASSET's celebrations, which have all contributed to its success and ambiance. Perhaps they also contributed to the ASSET culture of humor, and pleasure in collaborative work.

ASSET has remained committed to corporate, university, and other partners. We recently launched a "Corporate Partners and Friends for Improving Science and Math Education" program. Our hope is that this endeavor will provide increased visibility to our partner corporations and businesses while strengthening ASSET's ability to continuously deepen the impact of education improvement. Within this program, the partnership concept is more important than the fundraising. We are developing a group of corporate and foundation partners who know and understand what we do. Some of those people are on our board, and others on the Education Leadership Council, an informal advocacy group. That means ASSET is imbued with strength from without, another key feature for ASSET. None of us, not even an effective nonprofit organization like ASSET, can do this work by ourselves. We need support from multiple partners to affirm that we are doing the right thing, and to point out the positive results we are seeing. We now have nine corporate partners and friends that really understand our efforts: Bayer Corporation, Carolina Biological Supply Company, Delta Education, Duquesne Light, PPG Industries, Inc., Dollar Bank, Merck Institute for Science Education, Polito and Smock PC, and Westinghouse Electric Company.

Challenges and Compromises

It almost goes without saying that the sort of massive reform effort we have undertaken brings with it many challenges, some of which lead to compromises. Below, I highlight some of the challenges ASSET has faced, and how we have dealt with them. The challenges include those that come from using a business model, the need to help teachers see themselves as life-long learners, maintaining the quality of professional development while scaling up, the trade-offs in focusing on teachers at the expense of principals, and bringing about lasting classroom change.

Challenges of the Business Approach

ASSET has held firmly to the business model from the start, in that we offer services and leave it to districts to choose what they want and to evaluate implementation. As a result, we do not always get widespread participation in the kinds of professional development we believe are needed. Nor do we have authority over implementation in the classroom.

A case in point is the module-specific training offered by ASSET, which is a six-hour training. We would like these sessions to be longer and go into more depth, but districts did not want a full week of training per kit, even when the training was free. Thus, we offered an abbreviated form of the training that prepares teachers to do the mechanics of the module. We then encourage teachers to take Introduction to Inquiry, Science Notebooks, and content-specific institutes in the summer. We also developed Level 2 training that is module-specific, but focuses more on the content embedded in the modules. Teacher participation in these courses and institutes has not been as widespread as in the module training, but we hope attendance will increase as teachers spread the word about the value of this kind of professional development.

ASSET also offers study groups, which we believe are a very effective form of professional development for teachers as they deepen their understanding of the science modules. Resource teachers facilitate the study groups upon district request, when districts purchase the resource teacher service. However, many districts prefer to use the resource teachers in other ways because they are not yet fully aware of the benefit of study groups. A district that is fairly new to ASSET recently held a study group for 4th and 5th grade teachers, together with their literacy coach and an administrator, to discuss how to get the best use out of notebooking as a part of the science education program. That study group went very well, and we hope districts will increase their use of this strategy as they learn of the benefits. Our approach, then, is both to respond to demand and to try to create demand by offering the kinds of professional development we believe are needed.

Finally, ASSET does not take explicit responsibility for the quality of implementation; that burden has shifted to the school districts and teachers. We do ensure that the support products and services we provide are of the highest quality and that they will help meet the needs of the school districts and teachers to continually improve the teaching-learning process. Schools and districts must then take responsibility for making the best use of what we have to offer and for ensuring that teachers apply what they are learning to improve classroom instruction.

Teachers as Learners

One of the biggest challenges we face is changing the culture of teachers to view themselves as professionals and as learners. In order to become both, they have to leave the classroom and join other teachers. In the past, teachers have felt vulnerable when they were not confident in a topic or didn't know specific answers, especially regarding the science content. Under standards-based reform, however, teachers will see that even though their intentions are good, they may need help getting students to reach high standards. We are trying to get teachers to the point that they can say, "It's okay that I didn't already know how to implement standards-based teaching and learning; it is okay for me to go and learn that." ASSET provides a safe environment for teachers to admit that they may need to change some instructional practices in order to improve

all students' learning. Not only is it a safe learning environment, but the training we provide is engaging. Teachers don't need to bring papers to grade, because they will be busy and spending time with other professionals; over time, they come to see themselves as learners as well as teachers.

Maintaining the Quality of Professional Development While Scaling Up

I mentioned above that developing teacher leaders has been a key component of ASSET's approach. ASSET Resource Teachers have certainly been central to our professional development effort, but it has been a struggle to build the capacity of district-based lead teachers to maintain the quality of service that we desire. We trained lead teachers and anticipated that they would take over some of the professional development ASSET was providing during the LSC period. We found, however, that these teachers themselves had major needs in content and pedagogy, and very few could effectively train their peers. Sometimes they reduced the already abbreviated module training to a three-hour session, which was clearly inadequate. As a result, districts prefer that ASSET conduct module-specific training for teachers because they consider the quality of our professional development to be much higher than what their own lead teachers can provide.

The difficulty of building the capacity of lead teachers is one of the reasons we moved to a fee-for-service structure. With the large scope of the *Science: It's Elementary* initiative, however, ASSET does not have the staff to provide all of the professional development that is needed. Therefore, we will be working to develop lead teachers in a more focused and direct manner. In the past, the training we provided for lead teachers was broader, covering such topics as science content, pedagogical issues, and leadership. For the *Science: It's Elementary* program, we have required that each district identify a lead teacher for the primary grades and one for the intermediate grades at the outset. These lead teachers are asked to attend the NSRC Strategic Planning Institute, help select science modules for use in their districts, and teach one of the modules in spring 2007. When the lead teachers attend the ASSET Leadership Conference in summer 2007, training can focus on how to conduct the three-day professional development on the module they have just taught. We believe that this more focused, deliberate approach will enable lead teachers to walk out of the conference confident that they can co-facilitate the three-day session for teachers in their districts.

Focusing on Teachers vs. Principals

A difficult issue for ASSET has been where to focus our energy and efforts. From the beginning, teacher support has been at the heart of what we do. At the same time, we recognize the critical role played by principals. During the LSC, we realized that administrators were not well-informed about hands-on, inquiry-based learning. We offered various programs to administrators, including a summer institute where a small group of principals learned how hands-on, inquiry-based science supports state and national standards. We also had a study group of principals who met with our associate director (a former principal) on a regular basis.

While these activities were needed and appreciated, the challenge of supporting *Science: It's Elementary* has led us to re-focus our efforts around teachers. When we shared this decision with principals in the study group, they wanted to continue the study group on their own and asked that we advertise the group. We did so, but no participants signed on, so the principal

study group is no longer functioning. Those who participated in the principal study group saw the value of it, but given all of their other responsibilities, they were not able to maintain the effort on their own.

ASSET has grown at such an incredible rate and our reputation for serving teachers and for high quality professional development was carrying us much faster than we could handle if we continued doing everything we had been doing. We hope that in the near future, one of the entities in this region that focuses on principal development will partner with us and provide the support principals need in implementing science reform.

Achieving Classroom Change

As noted earlier, ASSET does not monitor the quality of classroom implementation. During the LSC years, however, we had an external evaluator who spent time with teachers and in classrooms. The evaluation showed that, overall, the quality of lessons was changing from "activity for activity's sake" to beginning stages of effective instruction. Specific areas of improvement included teachers attending to students' experience and preparedness, taking their prior knowledge into account, setting time aside for student reflection, and appropriate use of "wait time" during questioning. Improvements were also seen in classroom management, and there was evidence of increased collegiality among students during cooperative group work.

Even so, superficial implementation has been and remains a constant challenge. While the actual use of the modules remains quite high (over 90 percent), the ASSET Resource Teachers and I sometimes find when we visit classrooms that the instruction is not as inquiry-oriented as we would like. According to informal teacher feedback, turning points for change in instructional practice are participating in ASSET's five-day Institute for Inquiry (modeled after the Exploratorium's institute) and the follow-up that the ASSET Resource Teachers provide. Through the Institute and subsequent study groups, it is clear that teachers' beliefs are changing. As noted earlier, however, there is not as much demand for these kinds of professional development as we would like.

We believe change is happening in teacher beliefs and practice, but it is a slow process. When teachers come to our professional development sessions now, they are more aware of experimental design and the role of evidence in supporting claims; "science talk" and the language of hands-on, inquiry-based science have become more frequent. ASSET is making a difference in the classroom, but this kind of change takes time, persistence, and an attitude of continuous improvement.

Scaling Up

The ASSET approach has scaled-up science reform from two pilot districts to 48 member districts. Below, I share evidence of scaling up in terms of this expansion, district demand for our services and resources, and our research and development effort.

Expansion

As noted earlier, ASSET began its work with support from Bayer to implement reform in two pilot districts in 1993. In 1995, we were awarded the LSC grant and added 16 districts. Upon request and with a supplemental grant from the National Science Foundation, we added 14 districts to the science reform effort. When the LSC grant ended in 2001, we went to a fee-for-service structure. In 2005–06, we were serving 48 school districts and had over 2500 prepaid professional development participants. In 2006–07, through the state-funded, $10 million *Science: It's Elementary* initiative, we added 75 schools in 68 school districts to our 48 districts in southwestern Pennsylvania. Next year, the initiative may grow even more. While ASSET is challenged to scale-up at this rapid rate, we have received a warm reception from *Science: It's Elementary* schools and teachers, who have spoken of a desperate need for assistance in their science education programs.

Science: It's Elementary has brought much visibility to ASSET, and we are turning to our veteran districts to help us. With this added recognition, including several visits from the governor, ASSET's program has gotten more attention, superintendents are talking to each other about it, and districts that may have underestimated our potential impact are taking more notice.

A distinct advantage ASSET has is that we support the science education program in over 80 percent of the school districts in Allegheny County. Thus, when administrators, teachers, or students change schools, they are likely to still have the ASSET program and reform model well-entrenched in the district. Once we have built good relationships with individuals, we can continue to support them wherever they are located. We have been especially pleased to see teachers blossom as leaders among their peers or as new administrators over time, especially ASSET Resource Teachers who have returned to their districts after their two-year tenure with us.

With the huge scope of *Science: It's Elementary*, we have encountered a lack of qualified ASSET Resource Teachers to conduct the three-day professional development sessions. Those on staff are overextended (although exhilarated), and we need to recruit and train many more across the state to accommodate the scale expected in the coming years. ASSET's primary role is likely to change to becoming a trainer of trainers, rather than conducting the majority of the training ourselves.

District Demand

Even though the business model ASSET uses brings with it some problems, I believe it has been key to the project's scale-up and sustainability. Districts like what we offer, and have been coming to us in greater numbers because of it. One of the reasons the transition to a fee-for-service went so well is that ASSET supports the core curriculum in science; therefore, the districts need us. The ASSET Board and staff have considered a policy of dropping districts who do not "perform well," i.e., do not implement across the district and participate in professional development; however, we have decided that our role is to support districts in their learning, wherever they are on the learning curve.

Requiring member districts to buy into both materials and a minimum of professional development has encouraged districts to take advantage of ASSET opportunities on an escalating

scale every year. The services of the Materials Support Center (which incorporates best practices identified by the Association of Materials Support Centers) are critical and have enabled districts to adopt standards-based materials to support their curriculum. Supplying them with high quality materials at cost-effective rates, as well as with value-added items, such as storage and variety of materials, sustains the program.

Because 80 percent of school districts in Allegheny County are ASSET districts, they share one consistent program. However, each of the 48 member school districts has different policies, procedures, and systems. ASSET's approach is to be flexible in meeting school district/teacher needs but to keep the focus on the three main services: materials support, professional development, and research and development.

Research and Development

ASSET's research and development (R&D) program is an important factor in enabling us to continue to grow and sustain our work. After ASSET transitioned to a fee-for-service operation in 2001, we articulated the process of researching and developing new professional development and hands-on materials that we had been using informally during the LSC period to make it a solid part of the ASSET program. The annual process involves a group of 20 classroom teachers in research, field-testing, and piloting. This process results in a new product or service that is introduced to school districts through the Support on Site team members for the following year.

The R&D process has resulted in new products, such as a science notebook used by students, and accompanying professional development for teachers on how to enhance student learning through their use. Other examples of new products resulting from the R&D process include environment and ecology toolboxes that address state standards not met through the science modules and two new institutes, one focused on science and literacy and the other on foundations for teaching inquiry mathematics.

The R&D process has continued to become better defined and more productive each year. The process is also critical to our sustainability strategy in that teachers return for additional professional development that helps them continuously refine their craft, beginning with the science units, but also transferring to other subject areas as their skills improve. The chart below shows how new products and services have increased in use over the years:

Table 14.1
ASSET Products and Services

	Materials/Participants			
	2003–04	**2004–05**	**2005–06**	**2006–07**
Science Notebooks	600	690	9,960	12,000
Science Notebook Professional Development	167	455	253	Not available
Middle School Modules	167	242	330	420
Middle School Professional Development	39	38	152	Not available
Environment & Ecology Toolboxes	4	27	91	129
Environment & Ecology Professional Development	63	42	97	Not available

Closing Thoughts

As I reflect on ASSET's efforts to bring K–8 science reform to an ever-increasing number of districts, schools, and teachers, three issues come to mind. First, it takes both focus and patience to bring about change in teacher beliefs and classroom practice. We are trying to change a culture, not just the teaching of science. We are changing the way teaching and learning are happening in the classroom, and that just does not happen very fast. Patience with the process must also be accompanied by a clear focus. You can't do it all. We have concentrated on implementing NSRC's five components of an exemplary science program, with a focus on teachers; we have never changed from that and have not needed to.

The second issue is around the question of whether districts, schools, and teachers should be more strongly guided in the change process, or should be provided the resources and opportunities to change—to use as they see fit. By offering resources and allowing districts to choose and to monitor their own implementation, ASSET has encountered increasing demand, and we have been able to expand our services. Under the *Science: It's Elementary* initiative, however, our approach will be more prescriptive. Teacher leaders must attend the five-day ASSET Leadership Conference, where they will learn to conduct the three-day module training. In addition, participating school districts must commit to:

- Send a team from each school to a six-day NSRC strategic planning institute, where they will create a three-year plan to implement *Science: It's Elementary*;

- Send a team of district and community leaders to a one-day Vision Conference to create a long-term vision for science education in their school district;

- Send school representatives to a one-day Curriculum Showcase to choose materials from a selection of high-quality instructional modules, including FOSS and STC; and

- Send every implementing teacher to a three-day module training that incorporates inquiry, questioning for higher level learning, and integrating science and literacy through the use of science notebooks.

We are taking this more prescriptive approach for a variety of reasons. One is that one of our customers is now the Pennsylvania Department of Education. As we have always done, we are responding to the customer's need. In this case, the state has begun a science assessment program and will be measuring results, so they want the districts to make a commitment to obtaining the kind of professional development that is needed to change their approach to science. This is why the professional development opportunities are more prescribed than in the past.

Finally, I wish to address the issue of the need for an external facilitator of change. Some teachers have commented that school districts and teachers don't have time to do research on pedagogy and curriculum, and that is why they count on ASSET to share with them the research

that supports inquiry-based science. Even school districts that are visionary need an external influence to help bring about change. Note the earlier story about the principals in our study group who wanted to continue on their own but were unable to maintain the effort. Recently, Kansas City has undertaken a reform effort, but has hired someone from Bayer to lead the effort from within the district. Because educators are so consumed with the day-to-day tasks of their job—and also tend to be somewhat isolated within their own districts—they will likely have a difficult time bringing about this kind of reform without some external assistance. We and our partners make every effort to provide that assistance in a collegial way.

ASSET has been able to sustain its programs in materials supply, professional development and R&D primarily because we offer services that are high quality, relevant, and cost effective. We show results and have broad-based community support, especially from private and corporate foundations in the Pittsburgh area. Having corporate and foundation support has always compelled us to be accountable, especially being able to demonstrate improvement in teaching quality through improvement in student achievement. Over the course of the past five years, more and more superintendents have come to understand the breadth of the reform effort, as opposed to thinking of us as a vendor or kit supplier.

When we read research on sustainability by Dr. Jeanne Century and books such as Jim Collins' *From Good to Great* (2001), we see ourselves and know why the demands for our services continue to grow. Some of the principles we have adopted that mirror Century's and Collins' thinking are that persistent pushing in a consistent direction over a long period of time builds momentum; that the path to success is to focus on the things your organization can do better than any other; that change is brought about through dialogue and debate, not coercion; and that sustainability is not just maintenance, but learning and growing. We have practiced these principles over many years, and believe they have been instrumental in our success.

References

Century, J. & Collins, J. (2001). *Good to Great: Why Some Companies Make the Leap…and Others Don't*. New York, NY: Harper Business.
http://sustainability.terc.edu/index.cfm/page/404.