

Leadership in a Learning Environment

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Education is undergoing massive change. Our schools worldwide are facing two major transformations—a learning transformation and a technology transformation. This paper explores the role of principals and administrators as they lead their schools in blending together these two transformations. The paper notes the speed at which technology now permeates society, the impact of technology on teaching and learning, and the elements of school reform with their implications for the changing role of leadership. A technology infusion case study illustrates the ways in which leadership has served to integrate school reform and technology efforts to achieve classroom-based and systemwide change.

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*Those engaged in learning must gather together their spirit.
It is like a brazier full of fire. If the embers are gathered together,
the flames blaze up; if they are scattered, then it goes dark.*

Xia Shangpu, Chinese philosopher, 16th century

I look into the future for the benefit of my children.

Chief Sitting Bull, Sioux Indian leader, 19th century

*One can hardly believe there has been a
revolution in all history so rapid, so extensive,
so complete. ...That this revolution should not
affect education in some other than a formal and
superficial fashion is inconceivable.*

John Dewey, American educator, 20th century

Throughout human history and across our diverse cultures, education of our children stands out prominently for parents and for society. Our ambitions for our children are without bounds. We imagine for them better preparation for productive adult lives than we had, higher standards of living than we experience, and competencies to participate and to lead in the increasingly complex social, economic and political environment of our nations and world. We are not modest in our hopes. And, even as we are certain of our goals, attainment of them is not easy.

Education is undergoing massive change. Our schools worldwide are facing two major transformations—a learning transformation and a technology transformation. In my talk today I will focus primarily on the role of principals and school administrators in facilitating the learning transformation as they meet the challenges brought about by the precipitous and pervasive arrival of technology.

First I want to set three important contexts: the remarkable speed with which technology has permeated society; the impact of technology on the critical components of teaching and learning; and the reform agenda, with its implications for the changing role of leadership. I will then use a technology infusion case study in which TERC has been a partner and researcher to illustrate the kind of classroom-based and systemwide change that occurs when technology and reform efforts work in tandem.

Adoption of New Technologies

Any of us who looks back a mere decade recognizes that our uses of technology, and our expectations then about the value of technology, were limited indeed. Possibly we used computers for word processing and for data assembly and analysis. But little more. As recently

as twenty years ago the term "technologically literate" might have been reserved, without apology, to a niche market. And the term would have meant knowing about technology, not knowing how to use technology to meet a learning or productivity objective. Certainly technology literacy was not the concern of mainstream education public policy as it is today.

Why the dramatic change? Take a look at these data prepared by the U.S. Department of Commerce (1998) about the speed of market penetration for new technologies in the United States over the last 100 years. (See Appendix A.) When electricity first became available for public consumption in 1873, it took 46 years—or until 1928—to reach 25% of U.S. households. The personal computer, made generally available in 1975, took 16 years to achieve similar penetration. It is not surprising then to experience some breathlessness when we consider that the Internet has taken a mere seven years (from 1991 to 1998) to achieve the same level of adoption. From having 18 million users worldwide in early 1994, the Internet has exploded to more than 100 million users worldwide today—and Internet traffic is doubling every hundred days!

Clearly the remarkable, increasing universality of the personal computer and the Internet have a major impact on the ways we work and play, on the ways we experience distance and time, and on the ways we learn and communicate. The education policies of nations reflect these impacts. To illustrate: One of the seven priorities of the U.S. Department of Education is: "Every classroom will be connected to the Internet by the year 2000 and all students will be technologically literate" (1997). The Singapore government has a Masterplan for IT in Education that provides a blueprint for the use of instructional technologies in schools and for access to an IT-enriched school environment for every child (Ministry of Education, 1997).

The education policies of nations are dominated by this concern for instructional technologies because the abilities of a nation's workforce to use technologies effectively in the coming decades are seen as determinants of economic success. Just as the basic skills of numeracy and literacy and the fundamental behaviors of accountability fueled the industrial age, so too are the skills of technology literacy expected to drive productivity in the 21st century. This is acknowledged at the highest policy levels. Note the comment from U.S. Federal Reserve Board Chairman Alan Greenspan in a recent report to the U.S. Congress: "The dramatic improvements in computing power and communications and information technology appear to have been a major force" in current high economic productivity (1998). And again, by way of illustration, look at the fastest growing occupations expected in the U.S. in the coming decade. (See Appendix B.) They are dominated by technology positions that will expand by more than 100 percent (U.S. Bureau of Labor Statistics, 1998). The harbingers of these projections are with us today, as a recent New York Times article reported a shortage of nearly 346,000 qualified IT workers (Clausing, 1998).

Technologies' Implications for Teaching and Learning

This technology "revolution" has enormous implications for the ways in which we teach and learn. We must educate our children for occupations we cannot define, and for a world we can scarcely forecast. Not so simple!

What we do know is that our education system must prepare students with the basic skills of technology and with competency to use technologies. We also know that, if we ever thought we could, we can no longer define once and for all time what "essential" knowledge is. It keeps changing. We must focus on learning to become learners rather than learning to become knowers. The learning process never stops.

At TERC, an education research and development organization in Cambridge, Massachusetts, our research and other professional work are grounded in the theory that robust learning and genuine understanding are achieved only when students are active and thoughtful participants in their own learning. We believe that learning is ongoing, challenging mental work for all of us, requiring discipline, motivation, and engagement. Problem solving about important questions, marshalling data resources, and working in collaborative environments are tenets of this learning process (Sampson, 1998).

There is a vivid example of this kind of learning in the 1995 Hollywood movie *Apollo 13*. I'm going to share a few minutes of that movie with you today. The movie is based on the true story of the mission of Apollo 13. While I imagine that the Hollywood production dramatizes the events, the relationship between technology transformations and active learning, and the requirements for effective communications and team work are remarkably illustrated.

We join the mission which has been somewhat ill-fated from its moment of lift-off as it begins its journey from the moon back to Earth. The space crew has been forced to abandon the main cabin of the space craft and seek refuge in the landing module. But that module does not have enough oxygen to bring the astronauts back to Earth. On Earth, the mission commander points out the problem and demands a solution.

(The video clip from *Apollo 13* shows the team on Earth using replicated parts of the space craft to create a conduit to bring oxygen from the main cabin to the landing module of the space craft.)

It took this action and several other adventures to bring the astronauts safely home. Many of the mission's most dramatic moments required higher order thinking skills, problem solving, and a lot of teamwork!

Perhaps it is a fortuitous coincidence that, when properly used, technology is itself an enhancer and reinforcer of the very kind of learning that develops the thinking skills and behaviors needed in an era dependent upon technology. When this happens, learning occurs *with* computers, not *about* computers. And technology is no longer the subject of instruction, but a tool for instruction, serving as a transforming agent rather than as an amplifier of traditional practice (Rubin, 1996).

The Reform Agenda and its Implications for the Changing Role of Principals and Administrators

School reform without technology makes about as much sense as an Internet without computers.

(High-Tech Pathways to Better Schools, 1998, p. 23)

The learning transformation and the technology transformation are together reshaping schools and reinventing the roles of principals and school administrators.

The reform agenda. Educationally speaking, the decade of the 1990's will be remembered for its focus on systemic reform. Guided by two fundamental educational goals, reformers seek to provide a more challenging, rigorous, and thoughtful curriculum in all subject areas and to ensure that all students are supported in developing their full intellectual potential. These goals can be represented in two words: standards and equity. Comprehensive in nature, systemic reform focuses attention on the ways we introduce innovations to educational systems and how we nurture and sustain those innovations (Wasser, 1998a).

Most early reform efforts that encompassed technology focused on changes in individual classrooms. Longitudinal research that was integral to Apple's Classrooms of Tomorrow (ACOT) program, in which some Singapore classrooms took part, provides rich documentation of the evolution of classroom-centered teaching and learning with technology (Sandholtz, 1997). The reform agenda shifted from a classroom to a systemwide focus as the result of dramatic alterations in economic, financial, and technological infrastructures worldwide. Recently the Milken Exchange on Education Technology along with the publishers of *Education Week* devoted a special issue to "Technology Counts '98." In it they describe ten major school reform goals and examine the ways in which technology is appropriately integral to each (High-Tech Pathways to Better Schools, 1998).

The ten major goals and the title descriptor for each technology example:

- Teaching the basics—beyond drill and practice
- Teaching students to think—computers as teachers' aides
- Preparing students for a digital world—a goal in itself or a means to an end?
- Making learning "authentic"—lessons from a dirty river
- Changing the way teachers teach—away from the chalk board
- Building a better teaching force—everyone can raise their hands
- Forging the home-school connection—for more information, press 1
- Turning students on to school—technology as a motivational tool
- Making the most of assessments—new windows into a child's mind
- Opening up the classroom—the world is their teacher

As one researcher for the publication concluded: *"I won't say reform without technology doesn't exist anymore. But it's really hard to find serious reform efforts that don't have technology as an important, if not a driving, component"* (High-Tech Pathways, 1998, p. 23).

Changing Roles of Principals and School Administrators. These reform agendas propel us forward, necessitating significant change in the practices of teachers, in the experiences of students, and in the leadership of administrators.

Much has been written over the course of the last several years about education change and principals' and administrators' part in change processes (Lee, 1997; Maehr & Midgley, 1996; Patterson, 1993; Sarason, 1996). Themes central to this literature include recognition of

leadership and management skills as essential components. As described by two researchers who chronicled the role of school leaders as change agents (Louis & Miles, as cited in Fullan, 1991), leadership is about mission, direction, and inspiration; management is about designing and carrying out plans, getting the work done, and working with people effectively. To fulfill their roles successfully, principals must have both sets of skills.

Others have looked at principal and administrator roles from the perspective of tasks. For example, Smith and Andrews (as cited in Fullan, 1991) define four main tasks: resource provider, instructional resource, communicator, and visible presence. In his thoughtful analysis of educational change at the local level, Michael Fullan (1991) reviews the roles of principals and of school administrators. He concludes that a fundamental necessity of district administrators is to build the capacity of their schools to handle innovation. And for principals, he says:

"Serious reform, as we have seen, is not implementing single innovation. It is changing the culture and structure of the school. Once that is said, it should be self-evident that the principal as head of the organization is crucial. As long as we have schools and principals, if the principal does not lead changes in the culture of the school, or if he or she leaves it to others, it normally will not get done. That is, improvement will not happen." (p.169)

The challenge to provide *transformational* leadership is explored in a study currently underway by researchers from the Education Development Center, a colleague organization to TERC in the Boston, Massachusetts, area. The authors (Nelson, Davidson & Sassi, 1998) note that today's principals and administrators were themselves educated at a time when the *transmission* of knowledge from teacher and textbook to student was the traditionally accepted practice. The premise of these researchers is that the way in which administrators understand teaching and learning shape their administrative practice in support and recognition of those endeavors. Administrators, like most of the rest of us, try to model and reward practices whose outcomes they believe they understand and which they value. To the extent administrators understand learning as problem solving rather than memorization and teaching as providing resources and guidance rather than transmission, they are likely to evolve an image of classrooms that is different from the image held just a few short years ago and certainly different from their personal classroom and professional training experience.

Netherland researchers (Geijsel, Slegers, & van den Berg, 1998) also described such administrators as becoming transformational leaders. And a U.S. researcher (Marsh, 1997) explored the ways in which transformational leaders have strategic influence on schools in the context of environments where standards are increasingly set at the systemwide level, "results-driven" rather than "rule-driven" performance requirements are being applied, and the pace of change and complexity is accelerating. He particularly notes the worldwide nature of this phenomenon.

How do these various forces come together in single schools and school districts? I will turn now to a discussion of the Hanau Model Schools Partnership.

The Hanau Model Schools Partnership

The Hanau Model Schools Partnership was formed in 1995 as part of a test program in which technology is provided comprehensively to schools. The two major goals of the Partnership are:

- to infuse technology into a cluster of K-12 schools so that learning with technology becomes a deeply accepted part of daily school life for all members of the school community, and
- to support the development of exemplary teaching approaches that complement the aims of the district's and nation's educational reform goals and make good use of technology.

The work is supported by the U.S. National Science Foundation (NSF) and by the U.S. Department of Defense Education Activity (DoDEA). TERC serves as the design and implementation mentor and as the researcher in the Partnership. (See Appendix C.) The Model Schools work is described in detail in research reports and papers (Grant, 1998a, 1998b; McGillivray, in press; McNamara & Grant, 1998; McNamara, Grant, & Wasser, 1998; Wasser, 1998b; Wasser & McNamara, 1998; Wasser, McNamara, & Grant, 1998; Wasser, McNamara, & McGillivray, in press).

The site of the Model Schools Partnership is in Hanau, Germany. Here a cluster of four schools—two elementary, one middle, and one high school—serve approximately 1,500 students. Over the course of three years (1995–1998) the schools have become a collaborative cluster of more than 500 networked computers with a faculty broadly knowledgeable of the technologies available to them and the ways in which these tools can be applied to all grades and content areas. While these schools are on a U.S. army base, they are much like other schools. From the bulletin boards in the hallways to the gymnasium, from curricula to achievement tests, they look and sound and operate like schools so many of us know. And school administrators, principals, and teachers worry about much the same things: Will technology be of real benefit to students? Will students learn what they must know to perform well and to meet family expectations? Will adequate content and tools be available? Will I as a professional be able to function effectively?

The Model Schools Partnership was initiated as a technology infusion project. That is, it was to demonstrate the possibilities and implications of full-school technology integration and to document the supports required to undertake, institutionalize, and sustain such a systemwide technology initiative. It became apparent quickly, however, that technology infusion could only be achieved when and if it became a part of the district's education reform agenda. In sorting the rhetoric from the practice of that reform agenda, TERC researchers observed that changes in education practice were most likely to be grounded in teachers' struggles to understand and implement new curriculum adoption. The work of the Partnership became that of linking the broad principles of systemic reform with the specific requirements of effective teaching in a technology-enriched environment.

A broad four-part framework evolved as a way of describing the Partnership's efforts to integrate its systemic reform agenda and its technology integration goals:

Educational Practice. The composition and conduct of classroom learning activities and the growth of students' knowledge, skill, and experience as it evolves over the school year from engagement in these activities.

Professional Culture. The social medium in which adults in the schools interact, grow, and develop as knowledgeable educational professionals. This includes the composition and conduct of educators' formal and informal learning activities and the growth of their knowledge, skill, and experience as it evolves over the school year and through their careers as educators.

Technology Leadership and Management. The matrix of formal administrative structures and policies and the system through which learning experiences and resources are organized within and across schools.

Family and Community Participation. The services that support and extend young people's educational experiences outside the normal school day, and the family members and friends who support the learner and are concerned about his or her educational development and learning opportunities.

Principles of Commitment

The road to success is always under construction.

Anonymous

In addition to its framework, the Hanau Model Schools Partnership expressed its intentions to assure a model for full-school technology integration through an articulation of "principles of commitment." Like others who have worked for school change (Sizer, 1992), Partnership members recognized that beliefs or principles are often more powerful than tasks or standards. Such beliefs or principles speak to the individual and collective will that must be mustered to undertake large challenges and to the spirit of engagement that is required to succeed.

There are seven guiding principles for the Hanau Model Schools Partnership, each one expressed through tasks and structures that we illustrate here.

Everyone makes a commitment. Full-school technology integration requires the participation and commitment of every adult school member —teacher, specialist, and administrator. This is necessary to garner sufficient mass and momentum for systemic change. For Hanau, this principle was fulfilled in a full day of visioning, in which all adults shared their hopes and fears for school change and technology integration and provided a sense of how they would like to proceed and what they needed to do so. The Visioning Day was followed by the development of Technology Action Plans that committed all faculty and specialists to a process of technology learning in which each person defined what he or she would do for the coming year.

The commitment is for everyone. To assure inclusivity, a community-based, cross-school planning team, the Hanau Implementation Team (HIT), was established to develop the shared vision of the Partnership's goals and an overview of the implementation plans that would support these goals. Shared assumptions about tools, training, and technical support were also articulated. These include: (i) in a networked school, every adult needs a networked computer in his or her workspace; (ii) tools and training will be offered to every educator in the school, not to a select group; and (iii) the *same* small set of common software tools will be placed on every

computer in the schools. In addition, strong participation from families and community was expected, encouraged, and planned for.

There is full on-site support for the commitment. On-site support in Hanau is anchored in the educational technology team whose focus is the support of classroom learning goals through the integration of technology. This team offers formal professional development opportunities through workshops and informal training in the use of e-mail, web site searches, and classroom support. The technology team connects the four systemic components of the Partnership: educational practice, professional culture, technology leadership and management, and family and community participation.

There is full off-site support for the commitment. Full-school technology integration is a massive task and few schools possess the resources or experience to do it on their own. Outside expertise comes from others in the district and from external advisors. In Hanau, the district's presence provided the authority needed for implementation decisions and the technology integration work within the schools. District support empowered the schools' principals by offering them a range of financial and in-kind support.

The major features of support provided by TERC focused on professional development and included: (i) introducing school staff to new technology tools; (ii) helping staff connect their use of technology tools to content and administrative purposes; (iii) deepening content connections in specific content areas; and (iv) supporting individuals and groups to develop new leadership skills and forms of organization to support technology integration. Almost as an incidental benefit, researchers asking principals and faculty to reflect on their progress kept the goals and progress of the Partnership clearly present for everyone.

The commitment is integrated with district goals. From the beginning of the Model Schools Partnership, the district superintendent and assistant superintendent served on the planning and implementation team. Their participation and the other contributions of the district to the Partnership facilitated Hanau's success and gained the district experiences they could then replicate across the district. As new curricula were being introduced district-wide, the technology integration work in Hanau was designed and implemented to support the district's goals for curriculum adoption rather than to compete with it.

The commitment contributes to the system's goals. The Hanau Model School Partnership exists in a worldwide system. The Partnership drew notice of system officials who visited frequently to develop an understanding of how a technology infusion program could be comprehensively adopted in such a short period of time, and to use that understanding to develop systemwide initiatives.

Implementation of the commitment is a responsive process. All members of the Partnership are committed to listening to and learning from one another. Implementation was defined from the outset to provide opportunities for a constant reflective loop from action to discussion and critique, and, as necessary, to redesign and re-implementation of that action. Several techniques were used to reinforce this commitment, including: (i) the Technology Action Plans of individual

teachers, (ii) co-teaching; (iii) the fully representative Hanau Implementation Team, and (iv) the formative research process itself.

It is in the context of these principles or beliefs held universally by the Model Schools partners that the principals of Hanau's four schools and their district administrators were empowered to redefine their leadership roles.

Voices of the Principals

A critical learning for leadership is acknowledging that there will always be a need to learn more. One of the most essential behaviors a principal can model is a devotion to lifelong learning and a willingness to dialogue with members of the learning organization about how new learning reshapes existing knowledge.

(Robbins & Alvy, as cited in Principals Must Be Lifelong Learners, 1996, p. 6)

By 1997, a newcomer to any of the four distinctively different Hanau schools would be struck by their palpable sense of energy—in the classrooms, labs, and hallways, from the students, teachers, and principals. These are communities of learners who have taken big risks, who still struggle with new technology and with a deficit of good curriculum applications, and whose own skills are not yet adequate to the reforms they have embraced. (See Feldman et al., in press, for similar situations.) But these are schools with confidence about their future and about their abilities to succeed in ways they had previously never dreamed possible.

From 1995 through 1998, TERC researchers interviewed principals and administrators about the evolution of the Partnership, asking them to focus particularly on their goals and on an assessment of their schools' progress toward those goals. These interviews occurred at the beginning, in the middle, and at the end of each academic year. In addition, principals participated in professional development workshops offered in the summers of 1996 and 1997. The formal analysis and research reporting on the role of the principals in the change process is forthcoming. What follows here is a preliminary view, based on the authors' conversations and on an informal review of the interview material.

Walking the walk, not just talking the talk. First and foremost among the messages from Hanau's principals is the need they saw to be part of the experience, to lead by becoming learners, using the technology and allowing that use to change their practice. Perhaps the simplest example of "walking the walk" is illustrated in principals' use of e-mail. Early in the introduction of computers and connectivity to the schools, any use was hard—scary and time consuming. Principals reported sitting at their desks and d-o-i-n-g electronic mail as a discipline, supplementing their usual bulletins, announcements, etc. A year later, e-mail was credited with saving time, replacing the usual bulletins, and making communications easier, more complete, and more timely. As the principals' communications moved to e-mail, an important reason was created for each teacher to open his or her computer each day. And the culture of the school began to change as these new patterns of communication became typical.

Principals also spoke of their participation in day-long workshops for teachers, bringing their enthusiasm and commitment to those learning experiences. As one principal put it, it's important to experiment, to play. And another observed that it was not possible to be an effective principal without having a grasp of the technology.

Listen to a principal's account. (This video clip is a few moments of reflection from a Hanau principal about the principals' roles in technology infusion and school reform as they simultaneously led and learned in the Model Schools Partnership.)

Providing instructional leadership. Traditionally, the primary role of principals has been to provide instructional leadership. Certainly the Hanau principals saw this function as central to their credibility as school leaders. Their early fears were colorfully expressed by one teacher who reported to her principal: *"I've been doing a good job and I've been doing this for years this way. I don't need to change. And I'm too old to change. I'm too old to learn this new stuff."* Unsurprisingly, the beginning was chaotic, made so not only by teachers' doubts and protests. Infrastructure inadequacies, installation failures, and insufficient technical assistance marked the beginning, to be followed shortly by frustration with equipment breakdowns and inadequate user knowledge.

Two of Hanau's instructional leadership techniques stand out in this chaotic beginning. First, prior to the introduction of technology, orientation workshops were held for all the teachers and principals to introduce them to the technologies available and to guide them in their individual development of Technology Action Plans (TAPs). TAPs are lesson plans describing a content or developmental area that a teacher wants to focus on in her classroom matched with a software application to be integrated into this content area. TAPs served as a grounding point over the course of the first two years—not as measures of success, but as symbols of each teacher's commitment to try some specific activity of her own choosing. At first just a workshop exercise, these TAPs became a way of organizing individually created approaches to the technology and a way of introducing technology in each classroom to maximize the confidence and interest of each teacher.

The second instructional technique that stands out is the principals' facilitation of teacher collaborations and the co-teaching model in place across the four schools. The co-teaching model was introduced as a series of workshops in which outside experts with competencies to integrate technology with science, mathematics, social studies, and language arts worked side by side in the classroom with teachers. It evolved quickly to a teachers-helping-teachers model. The TAPs encouraged teachers to select technology applications of particular interest to them, with the result that teachers developed diverse skills and knowledge. From late in the first year of the technology infusion through the second year, principals encouraged teachers to share what they had discovered. The efforts in all cases brought the school closer together; teachers were found to be no longer "locked into their classrooms." One principal looked back over the two intensive years of the Partnership's implementation and noted: *"The deepest change over two years: teachers are talking to one another."*

In Hanau, instructional leadership is facilitated by the Partnership's selection of the same small set of common software tools that are placed on every computer in the schools. This common

"tool kit" includes work processing software, graphs and spreadsheets, multi-media presentation tools, communications capabilities, and MBL probes. (See Appendix D.) The tool kit aids professional development because it facilitates teachers' abilities to support one another and to share ideas. It also has strong technical advantages as it creates ease in working across multiple workstations and limits the universe of applications the technology team must support.

Mobilizing and targeting resources. The Hanau principals brought many years experience to the task and challenges of mobilizing and targeting resources for the Model Schools Partnership. This time the resources had to reach all classrooms and all teachers. Their strategies were many: I will highlight three.

Creating the educational technologist. A new position of educational technologist was conceived, which combined technology and teaching skills, so that the focus of technical support is to further learning. In Hanau, the educational technologist works with three staff members, a technology assistant, a district-based technologist, and a network administrator. The team serves all four schools, and reaches beyond itself to the information specialists and computer lab teachers in each school and to district support. The educational technologist is the anchor for professional development and technology integration, and a symbol of the commitment of leadership to the "on demand" needs of teachers. As principals reflected on their abilities to deliver resources in support of the goals of the Partnership, they most often mentioned the abilities of the educational technologist to work with teachers in classrooms, to provide training on software use, and to help with the hardware.

Finding time. The high school solved two major problems when the principal reworked the entire school schedule. First, by lengthening class periods the more exploratory nature of technology-enriched lessons had time to develop. And second, the new schedule created an eight-minute time saving each day that could be accumulated for an afternoon of inservice professional development every month.

Planning and policy making. The cross-school planning and policy-making team includes district as well as schools' representation, and it sets broad policy and resource allocation decisions for the Partnership. In addition to this group, each school has established a technology team comprised of the principal, teachers, technologists, union members, and community representatives. The principal in each school helps to shape the agenda of the school team so that matters of policy and practice are appropriately assigned, and the teams serve as positive forces for their constituencies.

Framing expectations. Instructional leadership and mobilizing resources are two critical elements in a principal's effort to bring about educational change. Another is to frame the expectations of how progress will be measured, and when and how to hold teachers accountable. When asked about the progress of the Partnership, principals said their primary early indicators were in terms of use: more student presentations, more teachers sharing with other teachers. Principals cautioned against incorporating standardized elements about student outcomes too early in the evaluation, indicating concern that the risk-taking nature of technology use needed first to be overcome.

At the end of the first year principals looked to teachers to have moved from "touching the computer" to "teaching with it." By the end of the second year, asking teachers about their use of technology was a routine part of their supervisory evaluation, but in a descriptive rather than evaluative sense. One principal observed that the school culture had changed such that all teachers now want to be adept at the computer; some were still having difficulty. Another indicated that teachers' own expectations had increased, that technology was being used in the learning process, not just in the preparation of end products. In this vital area, it is clear that the Hanau principals sensed that the large goals of the Partnership were best served by the gradual implementation of performance judgments.

Visioning, cheerleading—the whole school perspective. Schoolwide reform necessitates a schoolwide perspective and leadership that believes in the goal and is willing and able to model the risk-taking behaviors required. At every step, this is the role for principals, and it characterizes Hanau's four principals. Goal setting, managing emotions about technology, and working with parents are the three examples I will mention.

Goal setting. In practice, goal setting has far less to do with stating the goal than it has to do with infusing into all activities the sense of purpose that moves the culture toward the goal. The Hanau principals were comfortable with this understanding and spoke rather uniformly in a progressive and iterative way about the Partnership's goals. They began with goals to mobilize the resources and to initiate use, any use, of technology. By the second year, they spoke of teacher comfort with technology, curricula enhanced by technology, deepened learning. The context for these evolving statements remains the larger goal of providing the best possible education for students. As one principal remarked, "*We validate what we are doing by understanding we are doing the nation's agenda.¹ President Clinton talks of the future; for Hanau, it is now.*"

Managing emotions about technology. "From technology aversion to techno-envy and beyond" might well describe the transition in the Model Schools Partnership. In the Partnership's first year, modeling, persuasion, and understanding were required from each principal as he or she worked with teachers to invite computers to their classrooms and desks. Without diligent cheerleading, many teachers would gladly have swapped their machines for something more desirable. One year later, techno-envy had set in. All faculty were aware of who had the better and faster machines, whose software had been successfully installed, and who knew how to use which applications. The principals' abilities to see this transformation as progress in the goal of integrating technology as a tool in the learning process enabled them to propel professional development and instructional practice forward.

Working with parents. A vision for education can not belong alone to teachers or to teacher and principals. Parents are critical participants, and principals have a responsibility for facilitating a productive community/school relationship. In Hanau, parents were invited to participate in planning and implementing the Partnership from its inception. As a result, and most importantly,

¹Reference is to *Report to the President on the Use of Technology to Strengthen K-12 Education in the United States*, by the President's Committee of Advisors on Science and Technology, Panel on Educational Technology, March 1997.

parents became learners along with all other members of the Partnership. More than 100 parents and community members participated in technology workshops in the 1997-98 academic year, receiving 20 hours of training in the tool kit software. Many have since become regular volunteers, assisting in classrooms and labs with technology projects. Parents are invited to work together with their children in the evening in the schools' media centers. The messages from parents to principals were clear, and indicated the success of this community outreach effort: *"You can't take away his education. He's got to know how to use those computers. He's got to be able to get into society."* and *"You need to know how to drive a car. And you need to know how to use a computer."*

The role of the principals in visioning and in embracing a whole-school, indeed a whole-community, perspective was critical to the viability of the effort and could not be performed by any other members of the Partnership.

Building trust and letting go. The Hanau principals understood their leadership roles in designing and implementing broad-based school reforms, including the infusion of instructional technologies. Based on the beliefs subscribed to by all members of the Partnership, they created a culture in which risk-taking was safe. They worked hard to model and support the teaching and learning behaviors necessary to the success of their Partnership goals. In the end, this required building a community of trust and letting go, that is, allowing the teaching and learning experience to be owned by those engaged in it.

A final thoughtful reflection from one of the Hanau principals holds a message for the true measure of goal attainment:

"If somebody has a question, they run to each other. I think there's a sharing camaraderie that exists there that I'm not a part of at all."

Moving Ahead—Leadership in a Learning Environment

Learning, as we increasingly understand, is an active process in which the learner, not the teacher, is the defining participant. Each of us, whether child or adult, must participate actively in our own education; we must explore, discover, communicate, and interact, striving to use the resources and benefit from the teaching offered to us. Parents, teachers, principals, all of us caring about education and active in its offerings, have a deep responsibility to do the best we can to bring thoughtful learning experiences, powerfully useful resources, and insightful teaching and leadership to the work we are privileged to have.

Technology is transforming our lives, transforming our learning, and transforming our leadership. The synergies possible at the intersection of technology with communities of learners can only be effective with courageous leadership. School reform may not be possible today without technology; yet technology adds complexity and uncertainty. As the Hanau principals discovered, we are all breaking new ground. We are not trying to improve on old methods but to create new practices. School by school and district by district, our schools' principals and administrators worldwide are challenged to model the learning behaviors and to lead in creating

the conditions necessary to transform teaching and learning for the better, for our collective future.

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Appendices

- Appendix A: Speed of Change - U.S.A.
- Appendix B: Fastest Growing Occupations - 1996-2006 - U.S.A.
- Appendix C: Hanau Model Schools Partnership: Research Process Overview
- Appendix D: The Model Schools Tool Kit