

# MEANINGFUL MEASUREMENT

The Role of Assessments in Improving High School Education in the Twenty-First Century

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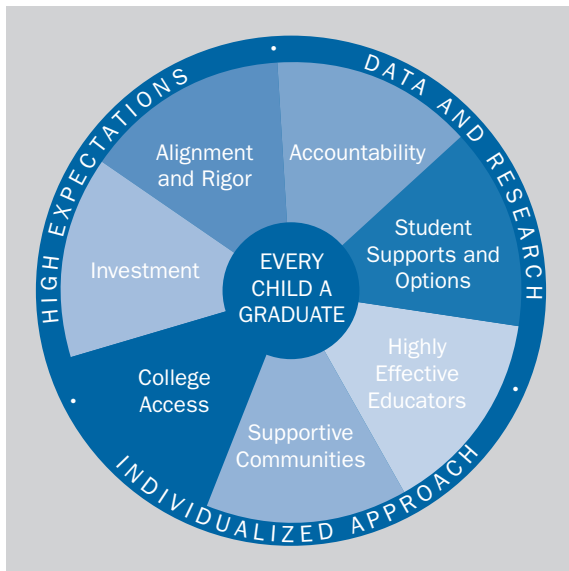
## About the Alliance for Excellent Education

The mission of the Alliance for Excellent Education is to promote high school transformation to make it possible for every child to graduate prepared for postsecondary learning and success in life.

The Alliance for Excellent Education is a national policy and advocacy organization, based in Washington, DC, working to improve national and federal policy so that all students can achieve at high academic levels and graduate high school ready for college, careers, and citizenship in the twenty-first century.

The Alliance has developed a “Framework for Action to Improve Secondary Schools” that informs a set of federal policy recommendations based on the growing consensus of researchers, practitioners, and advocates about the challenges and solutions for improving secondary student learning.

The framework, shown graphically here, encompasses seven policy areas that represent key leverage points in ensuring a comprehensive, systematic approach to improving secondary education. The framework also captures



three guiding principles that apply to all of the policy areas. Although the appropriate federal role varies from one issue area to another, they are all critically important to reducing dropouts and increasing college and career readiness.

## About the Editor

Lyndsay M. Pinkus is director of strategic initiatives at the Alliance for Excellent Education. Since joining the Alliance in January 2002, she has served in a variety of research, coordination, and advocacy roles, where her work has included managing policy and grant work on a range of issues including graduation rates, data, secondary school accountability, and secondary school improvement, and authoring a number of publications for the Alliance. Prior to rejoining the staff in January 2006, Ms. Pinkus served as a legislative associate at Washington Partners, LLC, providing government relations and policy research and analysis for a variety of clients, including the Alliance. She is a graduate of the School of Public Affairs at American University as a presidential scholar; the Public Affairs and Advocacy Institute at the Center for Congressional and Presidential Studies; and the Institute for Educational Leadership's Education Policy Fellowship program.

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# CHAPTER

## Assessments and Technology: A Powerful Combination for Improving Teaching and Learning

**Erin Martin Gohl, Daniel Gohl, and Mary Ann Wolf**  
State Educational Technology Directors Association

**I**t is time to move the American educational enterprise toward equity of opportunity for every learner and a high return on investment for resources and time dedicated toward the development of the future body politic. To do so, policymakers and educators must promote accountability, efficiency, and individual student development. The combination of improved, focused, and aligned assessments with the transparency and communication strengths of technology can help meet these goals.

This chapter describes how the use of technology to assess students and to record and analyze performance can result in timely, appropriate, and individualized instruction for all students. It will highlight some of the innovative approaches in using technology to assess student progress, address current challenges in the use of technology, and provide recommendations to federal policymakers to overcome those challenges.

## The Power of Assessments

Assessment and the reporting of performance are an intrinsic component of contemporary education. Assessment is the mirror through which students, teachers, educational bureaucracies, and communities evaluate educational effort and investment. Whether through a classroom quiz, a district-wide end-of-course exam, a state test mandated by the No Child Left Behind Act (NCLB), a privately funded college-readiness test, or an international comparison exam, judgments of educational success are made based on the performance of learners on an assessment instrument.

Because of this, assessments can be powerful tools by which educational stakeholders make decisions to improve upon the achievement of a particular student or group of students. District, state, or federal decisionmakers use summative assessments to measure the collective effort of schools and cohorts based on school entrance or intended graduation year. These collective measurements are used to analyze and inform resource allocations and judgments of effectiveness. By using certain assessments, some administrators are able to differentiate the approaches of different teachers in the same subject matter to determine those who are more effective or less effective. For an individual teacher, assessments are mechanisms for gauging how a learner has mastered the material or skill presented by a teacher. By seeing when performance is high or low, as compared to the way in which the material is presented, teachers are able to improve, in an iterative fashion, their own ability to instruct students. Because most classrooms in the United States contain students with a wide range of abilities, backgrounds, and learning styles, quality assessments are essential for teachers to adapt their teaching to varying needs. For a student, assessments provide an indicator of progress in the educational system, with high or low performance providing reward or concern. Changes in effort, approach, or instruction can be made after poor performance on an assessment, which will hopefully lead to more effective and productive learning. Effective instruction—and the teacher training and resources that support it—should enable a teacher to accommodate students with different learning styles, provide both enrichment and remediation, and allow for personalized instruction for each individual student rather than a single instructional mode for the whole class or group.

## Technology Supports Assessment That Improves Teaching and Learning

The use of technology can improve the assessment process through the delivery, sharing, comparison, and analysis of assessment instruments and assessment effectiveness. The efficient implementation of assessment through technology, and the decisions upon which the assessment results are made, will dramatically increase the time available for direct and individualized instruction to students. Technology use can increase the efficient use of classroom time for assessment administration, reduce the human workload for the grading of assessments, improve the recording of assessment results, improve the communication of immediate and longitudinal performance for every student, aggregate and analyze performance within and across cohorts of assessment takers, and allow for practitioners and policymakers to share data to inform decisions on resource allocation. The following section describes the role technology can play related to specific assessment types.

**Snapshot assessment:** Technology can enhance typical snapshot assessments administered to capture student knowledge at the end of a teaching unit, semester, course, or grade. For example, through technology-enabled snapshot assessments (summative or interim), students can be asked to engage in a broader range of prompts (such as video and audio) than is possible with static print. Writing tools such as the word-counting feature and spellcheck can be incorporated into assessments so that students can focus on the quality of the submission to a free-response prompt. Students can also be expected to demonstrate their knowledge by, for example, generating databases or graphs that reflect underlying structures of information provided to them, and to display creativity with form and color in brief periods of time that would not be possible without technology. These technology-based prompts are better reflections of the tasks required by universities and employers of postsecondary graduates.

**Portfolio/performance-based assessment:** In addition to improving the delivery of snapshot assessments, technology greatly enhances the implementation of portfolio and performance assessments. Through the utilization of technology, the use of multiple visual formats (text and graphics) is broadened, the extension to video and audio is enabled, and

the sharing of products is normalized. In addition, students have the opportunity in technology-based portfolio and performance assessments to include responses from audiences beyond their immediate teacher and community. Websites and social networking technologies open the process of critique to the world of informal response. This allows for students to make iterative change in portfolio products, or revisions in the performance, that is informed by teacher collaboration, community response, and personal reflection. Assessments at each point of iteration can serve as formative appraisals. The use of technology allows for the archiving of student work, the documentation of student alterations to work products, and the navigation of collections of student work.

**Classroom assessment:** Through the use of technology, classroom teachers can conduct innovative formative assessments of all students for the purpose of improving instruction. This provides exciting new opportunities for the remediation or enrichment of each and every student, helping *all* students reach their highest potential. Given the way that technology can now alter the speed and location of assessment, many options now exist to embed “on the fly” assessment into curriculum content and lessons themselves. The days of handwritten records and paper copies of classroom assessments are quickly fading. With increased curriculum content to cover, most teachers do not have the time to use paper methods for formative assessment. Widely available technology tools provide an efficient and effective option for formative assessment. Handheld devices for reading assessment, electronic response systems, and software are all technology-based formative assessment tools that have the power to help teachers effectively individualize instruction for all students. Blogs, chats, and Wikis used in the classroom environment help teachers gain an understanding of what students know and don’t know. Many districts and states are using technology-based programs and systems that provide teachers with formal and informal assessments to track student progress weekly or even daily. These types of formative assessments help keep students on track with achievement, while also providing opportunities for students to participate in engaging activities based on abilities and needs.

**Adaptations:** Technology can be used for the administration of adaptive, assistive, and alternative assessments that make use of an extensive range of

modifications and accommodations. Whether by restoring physical ability or translating language, for example, technology enables more students—such as those with disabilities or limited English proficiency—to participate in assessments and demonstrate their proficiency. This helps ensure that more students are held to universal educational expectations (a prerequisite for an equitable society) and that students are evaluated in an equitable manner that maintains the validity of the evaluation for inclusion in group-based comparisons.

**Sharing of best practices:** The use of technology for improving formative assessment is not limited to teachers and students in individual classrooms engaging in iterative improvement in isolation. Technology enables the sharing of assessment instruments, the rapid dissemination of innovation, and the tools through which to align classroom, district, state, national, and international assessment questions. By enabling assessment instruments to be viewed, and therefore shared, the challenge of developing new assessments can be addressed simultaneously with the need for transparency. Technology can create communication mechanisms, test question repositories for public access, and secure domains for test question development.

## Technology in Action

Highlighted below are a few examples from states and districts using technology-based assessments to individualize instruction to improve student achievement, remediate before it's too late, track individual student growth and progress, and achieve school-improvement goals.

- **Texas TAKS**

Texas uses a computer application as an electronic bridge between state test results—which identify each student's strengths, weaknesses, and areas of needed improvement—and the supporting instructional software. Each student's individualized learning path is created, and student assignments are based on objectives that were not mastered on the state test. Optional progress assessments may be administered during the year to allow teachers to monitor and modify student progress within the learning paths as needed. Further, teachers have an opportunity to add learning activities or create alternative learning paths based on classroom priorities.

Summative assessments are provided at the end of each year to gauge student progress and readiness for the next grade level.

- **Virginia's Algebra Readiness Initiative**

Virginia's Algebra Readiness Initiative (ARI) assists in preparing students for success in algebra through a computer-adaptive test. School divisions are eligible for incentive payments to provide mathematics intervention services to students in grades six through nine who are, as determined by diagnostic tests, at risk of failing the Algebra I end-of-course test. The diagnostic test results allow teachers to individualize the content for intervention. A pilot study conducted during the 2005–06 school year to explore the efficacy of this approach in grade five showed that students improved by more than eighty scale score points between the Algebra Diagnostic Test given at the start of the year and the one given at the end. Teachers reported that the ARI helped determine the learning styles of their students (i.e., a preference for formula-based learning versus more hands-on math activities) and ultimately allowed for appropriate teaching modifications.

- **Indianapolis Public Schools, Indiana**

Beginning in the 2007–08 school year, Indianapolis Public Schools adopted a software and reporting platform that fully integrates their current core curriculum with formative assessment data, helping to take data-driven decisionmaking even further by providing teachers with explicit support in using individual student data to pinpoint appropriate and effective basal lessons. By creating a strong link between the software-enabled assessment and the district's curriculum, educators were better able to craft instructional plans targeted specifically to their students' learning needs. The district has made consistent gains year after year. During the 2007–08 school year, 49 percent of the K–3 students who were identified as being at high risk for reading difficulty at the beginning of the year left the high-risk category by the end of the year, with 27 percent of those students reading at or above Benchmark level; in addition, 46 percent of students identified as being at some risk for reading difficulty were reading at Benchmark by the end of the year.

- **Arizona’s Formative Assessment Item-Bank**

Through its IDEAL (Integrated Data to Enhance Arizona’s Learning) Web portal (<http://www.ideal.azed.gov>), Arizona provides a range of assessment tools, accessible by all teachers in the state. This includes a formative assessment item bank with over 5,500 items, and more than one hundred pre- and post-assessments, including performance objective snapshots, all aligned to the state’s standards.

- **Alaska’s GLE Item Sampler**

Alaska’s Formative Assessment GLE Item Sampler provides a bank of formative assessment items aligned to the Alaska Grade Level Expectations in math, reading, and writing for grades three through ten. These assessments are intended for use by all Alaska teachers to guide and adjust their instruction during the learning process and to differentiate classroom instruction so that the needs of each student are met.

- **NAEP Test: Problem-Solving in a Technology-Rich Environment (TRE)**

Through its Technology-Based Assessment Project, the U.S. Department of Education is exploring the use of new technology in administering the National Assessment of Educational Progress (NAEP) to measure skills that cannot be easily measured by conventional paper-and-pencil means. For example, as part of the Problem-Solving in a Technology-Rich Environment (TRE) pilot, tasks to measure eighth-grade students’ mastery of the kind of problem solving done with computers in educational and work environments was embedded within a physical science assessment. Students were given two extended scenarios designed to measure their ability to solve problems using technology. The assessment required students to search the Internet (using a simulated World Wide Web environment) and locate and synthesize information about scientific helium balloons. The “simulation” scenario required students to conduct experiments of increasing complexity about relationships among buoyancy, mass, and volume. These scenarios were delivered via school computers or on laptop computers

brought into the schools. The assessment produced a total score and separate scores for computer skills, scientific inquiry, scientific exploration, and scientific synthesis.

## Barriers to Technology Integration and Assessment Improvement

Though there are these and other cases around the country where schools, districts, and states are using innovative technology-enabled assessments to improve teaching and learning, the full potential impact of technology to assure effective assessment in support of educational achievement has yet to be realized. In order to improve the quality of assessment and the integration of technology, there are a number of challenges that must be overcome, including the ones listed below.

**Technology infrastructure:** A major challenge for many school districts in using technology to administer assessments is the lack of an adequate technology infrastructure to support the broad-based implementation of such efforts. Many of these assessments require high-speed broadband as well as classroom access to equipment, which many schools lack. Thus, assessments that require broadband would be sluggish or unusable in these schools. In many districts, access to computers and other hardware to utilize technology-based assessments is also limited, with some schools' technology primarily available in labs, apart from classrooms. Until the technology is in the classroom and teachers can use it as a natural part of their teaching, the full potential of technology-enabled assessment will not be realized.

**Interoperability:** As assessments systems (tests, projects, etc.) are developed, it is important that information is able to be shared among practitioners, appraisers, and researchers. Currently, there is no standard format for presentation and distribution of results. Without a standard framework, the data collected from the resources cannot be appropriately used for research and evaluation.

**Teacher training:** In order for teachers to effectively use technology-enabled assessments, they must be properly trained to integrate these practices into their everyday classroom instruction. Many states and school districts, however, do not sufficiently fund sustainable professional development opportunities around effectively using technology to assess students. The

National Staff Development Council advocates that “at least 30 percent of the technology budgets be devoted to teacher development because technology purchases have increased dramatically in many school districts during the past decade, often with little attention given to the development of teachers’ abilities to use the technology.” Opportunities for teachers to learn, plan, and practice are critical to maximizing the potential of technology to improve student achievement.<sup>1</sup>

**Lack of communication with all stakeholders:** Technology is often seen as separate from mainstream curriculum. Administrators, curriculum specialists, professional development leaders, teachers, and technology support staff often work in silos. However, in order for technology-enabled assessments to be effective and fully integrated into teaching practice, stakeholders must communicate regularly so that all parties understand and commit to a comprehensive educational and professional development process. For example, information technology staff members need to work with other members of the educational team during the planning and budgeting process so that broadband and access issues are addressed.

**Deficiency of pre-service programs to address technology integration:** Training for the use of technology and technology-based assessments needs to begin during pre-service teacher training programs. Currently, these programs rarely employ technologies that are utilized in assessment. Colleges of education must modernize their pedagogical instruction to best prepare teachers for twenty-first-century classrooms, including technology-integrated instruction and assessment. Pre-service programs for both teachers and administrators must establish the expectation that technology is critical to improving the range of assessment, provide experiences using technology-enabled assessments, and offer training to improve the use of such assessments in the classroom and analysis and use of their results.

**Inertia of vision:** The procurement, implementation, and use of technology in schools has often been perceived as an optional expenditure with local funds. The federal E-Rate program, which provides need-based discounts to help U.S. schools and libraries obtain affordable Internet access and telecommunications, has allowed local and state funders to rapidly expand the infrastructure of connectivity. No subsequent funding commitments or

policy priorities have built upon the platform of connectivity constructed through E-Rate. As a result, there is a strong foundation to use technology for delivering, communicating, and analyzing assessments and results. Leadership is required to finish the fulfillment of this vision.

In addition to the challenges of integrating technology into classroom instruction and assessment, more general improvement must occur in particular areas in order to maximize the potential for assessments to improve teaching and learning. Some of them are listed below.

**Teacher and administrator training:** In order to be effective, teachers must be able to analyze the data produced by the assessments. Many teachers and administrators, however, have not received this training in either pre-service or in-service coursework. The skills of planning, delivering, and analyzing the results from technology-enabled assessment need to become—along with classroom management and standards-based instruction—a standard expectation for all educators.

**Lack of classroom time for assessment analysis and reteaching:** In the current climate, time demands caused by the breadth and depth of standards and curriculum limit the time for assessment and are so severe as to almost preclude reengagement with material after its initial presentation. Further, teachers are expected to be the primary designers, implementers, and graders of assessments. This limits time for engagement with students.

**Curriculum:** The current standards-based curriculum used by most districts, with daily pacing charts and dominant use of heterogeneous grouping of large student classes (not allowing for factors such as learning style, special needs, or language fluency), causes teachers to feel pressured to teach everyone in the classroom as a unit. This results in teachers not being able to address any gaps in understanding revealed by formative assessment.

**State longitudinal data systems:** With the federal testing requirements of the Elementary and Secondary Education Act, most states have been administering standardized tests for more than a decade. Several states, with some federal support from the Institute of Education Sciences State Longitudinal Data Systems grant program, have begun to grow these

state data systems by integrating test scores with key demographic and achievement information from students. However, even these states have lacked sufficient time, resources, support, and training to effectively utilize that data to intervene in student achievement across the state. Statewide longitudinal data systems are crucial both for accountability and for providing comparative data across district and state lines to ensure that all students are receiving relevant instruction aligned to baseline academic standards. However, state systems are not designed to drill down to the student and teacher levels for the purpose of individualizing instruction.

### **The Role of Policy in Overcoming These Challenges**

The development of coherent policy at the local, state, and federal levels that allows for assessment development and implementation to be aligned is critical to ending the isolated efforts that characterized twentieth-century educational accountability. Policy frameworks and adopted policy need to direct professional efforts toward transparency of the assessment instruments, alignment with standards, and the manner in which achievement is reported to students, families, and schools. The gap between the level of achievement measured in both formative and summative assessments in the classroom and the collective measures of achievement reported by No Child Left Behind requires a policy-based solution. All citizens need educators and education funders to improve education. Policy designers and implementers can improve the relevancy of administered assessments, and ensure that the improvement of assessment outcomes is a standard expectation of professional educators.

### **Key Federal Policy Recommendations**

- 1. Achievement Through Technology and Innovation (ATTAIN) Act**  
Provide federal leadership to support states and districts regarding technology's role in school reform by passing the ATTAIN Act authorized at \$1 billion. The ATTAIN Act would revamp and replace the current Title II-D of the Elementary and Secondary Education Act by building on its successes and focusing resources on those practices known to best leverage technology for educational improvement. The program works to

- ensure that through technology every student has access to individualized, rigorous, and relevant learning to meet the goals of NCLB and to prepare all students and America for the twenty-first century;
- increase ongoing, meaningful professional development around technology that leads to changes in teaching and curriculum and improves student academic achievement and technology literacy; and
- evaluate, build upon, and increase the use of research-based and innovative systemic school redesign that centers on the use of technology, leads to school improvement, and increases student achievement.

The ATTAIN Act would sustain this support for the federal investment in school improvement through technology and innovation.

## 2. E-Rate

In order to strengthen the technology infrastructure of our schools, policymakers should increase funding for E-Rate, a program under the universal service fund that provides schools and libraries with discounts for telecommunications services, Internet access, internal connections, and maintenance of internal connections, based on the socioeconomic need of the school, to meet current and future high-speed broadband needs. At a minimum, federal policymakers should adjust the E-Rate pool of \$2.25 billion for inflation.

## 3. State longitudinal data systems

Federal policymakers must support the coherence of data systems among the state, district, and school levels. Policies should encourage states to align systems so they are able to drill down in the data to the student and teacher levels for the purpose of addressing teacher quality or individual instruction. Each state should redefine its role of “data compliance officer” to “data leader,” and work to help stakeholders throughout the system use data to improve education at all levels.

As data leader, states should support districts in tying together their own data systems with formative assessment through the use of learning management systems, providing training to teachers on how their formative, interim, and summative assessments should be aligned with and contribute to the longitudinal data for student performance; and training educators on how to mine data for decisionmaking and changes to instruction and interventions.

States must also begin helping schools and districts address how relevant formative assessment and demographic data can “flow up” to the state to inform systemic changes in policies regarding school reform and student achievement.

Federal policy can support these activities by requiring that the federal data policy agenda—including funding—addresses these issues.

#### **4. Development of state assessment banks**

The federal government should encourage states to create electronic assessment repositories that contain interim, formative, and summative assessments aligned with state standards. States should provide funding for master teachers to come together for the initial development and review of the items in the bank. This resource should be accessible to all teachers, students, administrators, and parents both within schools and remotely, and should allow for contributions from the field. Federal policy should fund a pilot program for the development of such banks and evaluate the impact of their usage on teaching and learning.

#### **5. Elementary and Secondary Education Act**

In order to ensure that teachers and administrators can effectively carry out assessments, districts should be encouraged to use their Title I and II funding to train teachers and administrators on using and analyzing data, administering quality and innovative assessments, and integrating technology into their classroom evaluations to support teaching and learning. For districts and schools found to be “in need of improvement,” additional school improvement funding

should be used for this kind of professional development to help raise achievement for the targeted population(s).

## 6. Higher Education Act

Funding through the Higher Education Act should go toward pre-service professional development programs that foster individualized instruction through the use of data. Federal funding should encourage the development of analytical skills around both data collection and analysis and the creation and use of effective assessments in teacher and administrator training programs.

The views expressed in this chapter are those of the authors and do not necessarily represent those of the Alliance for Excellent Education.

### About the Authors

**Erin Martin Gohl** has worked at multiple levels of the educational system. Most recently, she was the director of education policy for Bernstein Strategy Group, a government relations organization focused on education policy issues. She has consulted with the New York City and Palm Beach County school districts; conducted school-, district-, and state-level evaluations of school choice programs in New Jersey; and assisted in the research, planning, and production of toolkits for the State Educational Technology Directors Association's National Leadership Institutes and the International Society for Technology in Education's National Education Computing Conference. Ms. Gohl has focused her academic research on issues of educational equity and access and the political dynamics involved in creating sustained education reform in urban school districts. She has also presented papers at various education-related conferences. Ms. Gohl received a bachelor's degree in American history from Princeton University and did her graduate work in politics and education at Teachers College, Columbia University.

**Daniel Gohl** is an accomplished educator who has experience in secondary school reform, the role of technology in education, STEM program design, and school leadership. He has served as a teacher at the secondary and college level in the fields of physics and astronomy, a high school principal, an information technology coordinator, and a director of secondary school reform. With experience in consulting with schools, districts, and state education agencies throughout the United States, he has developed expertise in collaborating with communities to address issues of achievement gaps between subpopulations, integrating academic and work skill

instruction, and ensuring meaningful learning in math, science, and technology. He has received a number of awards for teaching and school leadership, served on national committees on technology utilization and laboratory design for schools, and currently serves as president of Ontic Education LLC. He holds a master's degree in science education from the University of Texas at Austin and a bachelor's degree in physics from Vassar College.

**Mary Ann Wolf** is the executive director of the State Educational Technology Directors Association (SETDA). In this position, Dr. Wolf works with educational technology directors in all fifty states and the District of Columbia and works with policymakers to share models of how technology is critical to transforming our education system. SETDA contributed information and research for the development of the Achievement Through Technology and Innovation (ATTAIN) Act.

Dr. Wolf has led the Education Forum and has specifically contributed to SETDA's National Trends Reports on EETT; *Maximizing the Impact: The Pivotal Role of Technology in a 21st Century Education System*; SETDA's annual July issue with *THE Journal*; and the Class of 2020 Action Plan for Education. She taught fifth grade and worked for KPMG as a consultant for federally funded grant programs. She has a PhD in education from the University of Virginia, a master's in elementary education from the George Washington University, and a bachelor's in accounting and marketing from Georgetown University.

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<sup>1</sup> D. Sparks, "Plugging Educators into Technology," *Results* (Alexandria, VA: National Staff Development Council, 1999), <http://nsdc.org/library/publications/results/res2-99tech.cfm> (accessed October 15, 2008).