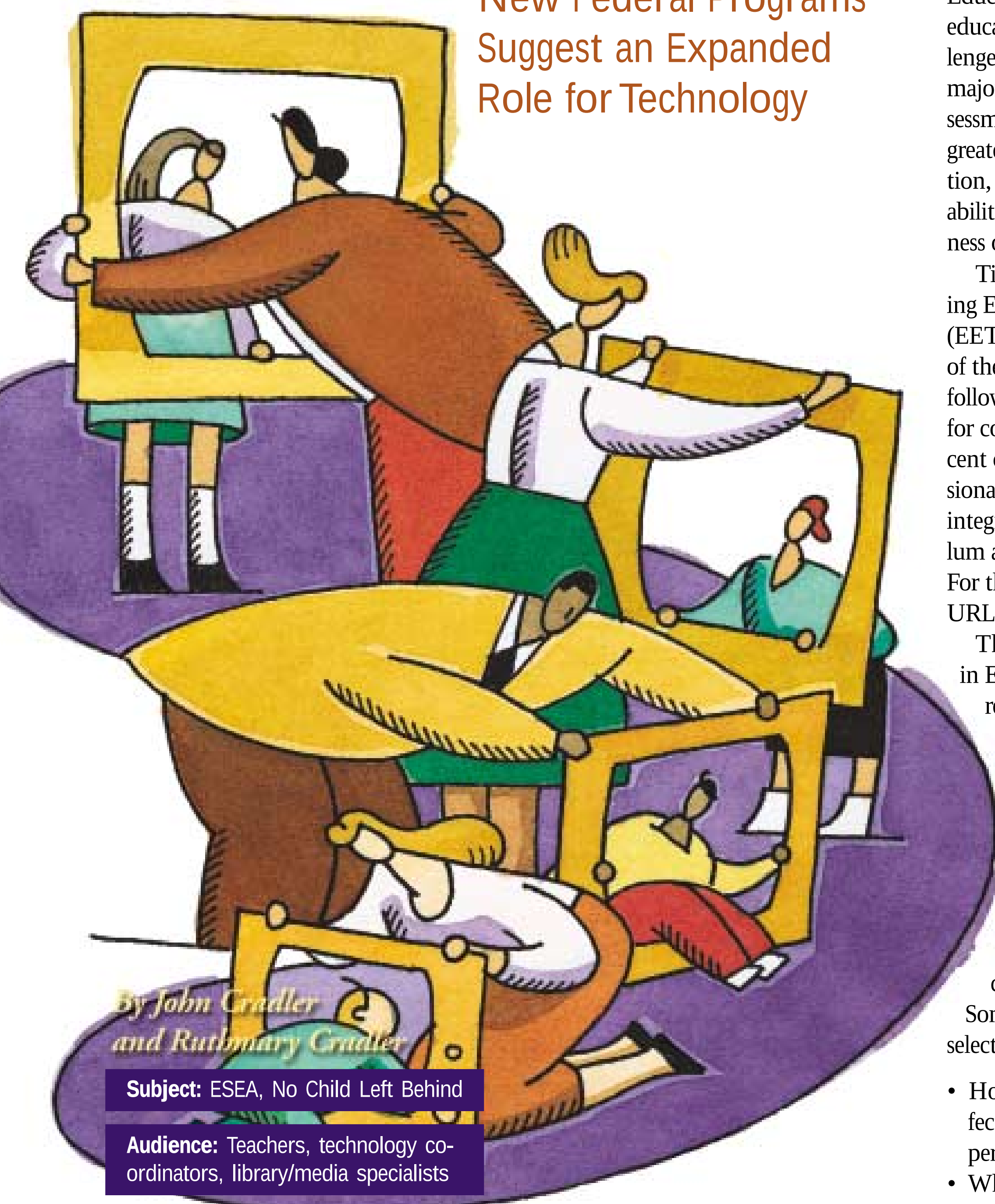
NCLB Poses Challenges

New Federal Programs Suggest an Expanded Role for Technology



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Subject: ESEA, No Child Left Behind

Audience: Teachers, technology coordinators, library/media specialists

Grade Level: K–12 (Ages 5–18)

Standards: *NETS•T* IV; *NETS•A* I, III, V (www.iste.org/standards)

Supplement: www.iste.org/L&L

No Child Left Behind (NCLB), the 2001 revision of the Elementary and Secondary Education Act (ESEA), presents the education community with major challenges and opportunities. NCLB has major implications in the areas of assessment and technology. It permits greater flexibility in delivery of instruction, but mandates extensive accountability and evaluation of the effectiveness of program interventions.

Title II, Part D of NCLB, Enhancing Education through Technology (EETT), provides grants to states. Half of the funds are allocated for districts following Title I formulas and half are for competitive grants. Twenty-five percent of the funds must support professional development that emphasizes the integration of technology into curriculum and instruction. (*Editor's note:* For the NCLB Web address and other URLs, see Resources on p 56.)

The Center for Applied Research in Educational Technology (CARET) reviews studies on educational technology, deriving practical suggestions for educators from valid study findings.* (See the April 2002 Research Windows column [*L&L*, *29*(7), pp. 46–49] for more details about CARET.) CARET's recommendations may help educators meet the challenges emerging from NCLB. Some questions driving CARET's selection of studies and resources are:

- How can we use technology to effectively assess and monitor student performance?
- What are effective strategies for using technology to link assessments to instructional planning?

** CARET is a program supported by the Bill and Melinda Gates Foundation. The resources and programs cited in this article have not necessarily been subjected to empirical study, and would be categorized by CARET as a Type II, or descriptive document, rather than a Type IV or experimental research study.*

- How can we use technology to communicate assessment outcomes to students and parents?

The U.S. Department of Education (ED) approved state implementation of NCLB and technology plans during July of 2002. Districts will now prepare plans and proposals for local uses of NCLB funding programs in the areas of reading, mathematics, and other core subjects, technology, student assessment, professional development, and special programs such as after-school services for eligible students.

Instructional interventions funded by NCLB must show research-based evidence of effectiveness (this is mentioned 111 times in the authorizing legislation, House Resolution 1). Educators must compare student performance with standards-based benchmarks, and report results using a comprehensive student information system. Student assessment data should be analyzed and disaggregated to inform instructional planning. Most states and school districts do not have a system in place for measuring, reporting, and using student data to inform decision making. Further, most producers of learning resources have not invested in external evaluations or research to document the effectiveness of instructional interventions they produce. *eSchool News* recently suggested that state technology directors are most concerned with the evaluation requirements of NCLB:

> evaluation poses a significant challenge for states and school districts … this is a real paradigm shift in everyone's thinking and forces change in how we do things … the new requirements mark a shift away from a mentality of "just give me the technology money and let me decide how best to use it" … and the requirement that schools use scientifically based research is one of the most difficult to deal with. (*eSchool News*, 2002)

In the Evidence-Based Education (EBE) presentation (Whitehurst, 2002), the ED formally defines this more rigorous evaluation and research approach. It defines requirements for the application of scientific methods combined with professional wisdom to objectively document the effectiveness of an instructional intervention. For example, within a math curriculum, how would the achievement of students using a particular multimedia program compare to the achievement of similar students not using the program? EBE also underlies the process for validating educational programs and the practices to be selected for the new What Works Clearinghouse, a collection of online assessment and report databases to be launched by the ED soon.

A "logical model" for the design and implementation of NCLB plans emerges after an analysis of the guidelines, with consideration of the EBE approach. The chart in Figure 1, on p. 48 shows a possible conceptual framework for NCLB implementation. It illustrates a framework for the implementation and assessment of educational programs, with specific applications of technology. State, regional, district, and school planners can use this conceptual model to help guide local NCLB plan development and as a visual aid to explain the program to other staff and community members.

In the Program Implementation phase is the Context (I), or conditions and factors that enable and support the Interventions (II), which include the NCLB-funded programs and resources. For example, if online education is the intervention, the availability of teachers qualified to design and teach courses might be the context for success.

In the Program Outcomes phase is Instructional Change (III) and Student Outcomes (IV), which both result from the Intervention. For example, because teachers of online courses were proficient in course design and delivery, students attained related academic performance standards. Assessment and Analysis (V) applies multiple measures including online student assessments, district or state assessments, surveys on implementation factors, and/or course evaluations against standards. A discussion of technology applications for each area follows.

I. Instructional Context. The context, or background conditions influencing interventions, instructional changes, and student outcomes, must be considered when planning, implementing, or evaluating any instructional program. CARET has identified several studies and resources that will help educators to understand, plan for, and establish optimum conditions for technology-based interventions. For example, a study by Zhao, Pugh, Sheldon, and Byers (2002) found instructional context to have "a strong mediating effect on the success of technological innovations." The study identified administrative support, technological infrastructure, and peer support as three aspects of the school context that determine the success or failure of the integration of technology into instructional programs. A major conclusion of most

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CARET is an online source of information about strategies and programs using technology that have varying degrees of proven effectiveness.

studies reviewed by CARET is that, more than the technology itself, the context or condition under which technology is applied influences its effects. (This could also mean that many studies do not sufficiently control for extraneous conditions or contextual factors that would influence outcomes.) Access to sufficient Internet bandwidth for applications, the ratio of students to computers, time for teacher planning for technology integration, technical support, and staff development are other factors to consider. When planning for technology integration, educators could use checklists and rubrics that consider instructional context, such as those listed in the online supplement to this article (www.iste.org/L&L).

II. NCLB Program Interventions. As previously mentioned, NCLB-supported programs, resources, and products must have "scientifically proven" evidence of effectiveness. CARET is an online source of information about strategies and programs using technology that have varying degrees of proven effectiveness. For example, CARET's review of studies on teacher professional development found that the most effective models involve teachers in collaborative planning and development of instructional projects, include assessment of specific standards-aligned technologies, and conduct "action research" (Cradler, McNabb, & Freeman, 2002). The ED Educational Technology Expert Panel and the What Works Clearinghouse describe programs and resources that have proven effectiveness. Publishers and developers of electronic learning resources sometimes have external evaluations that document effectiveness of products and online learning resources. The California Learning Resource Network (CLRN) provides a comprehensive database of information about electronic learning resources that align with the California Content Standards. CLRN also collects any available research on electronic learning resources, but has found that very few of these studies incorporate the level of scientific rigor suggested by the ED according to the Evidenced-Based Education and NCLB guidelines.

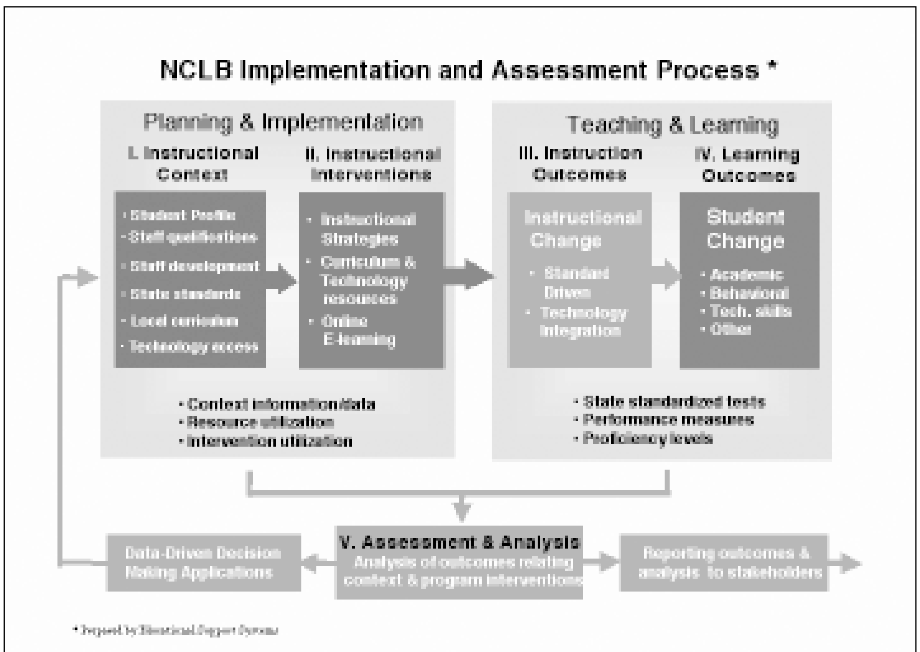

Figure 1. A conceptual framework for NCLB implementation.

We assume that resources specifically aligned with standards have a higher probability of increasing learning outcomes related to these standards; however, we need further research to clearly document the effect of state standards on learning.

An evaluation of the Department of Defense Education Activities (DoDEA) Presidential Technology Initiative (PTI) was conducted by the University of California's National Center for Research on Evaluation, Standards, and Student Testing (CRESST). When teachers faithfully developed and implemented personalized plans for the integration of technology into the curriculum, known as Curriculum and Technology Integration Plans (CTIP), they increased student learning and sustained infusion of technology into instruction (Klein, Glaubke, Yarnall, & O'Neil, 2000). The CTIP process enables the teacher to carefully consider the educational context, plan locally innovative technology interventions, and assess student change based on state and local content standards (Cradler & Cradler, 1997).

Education Week's "Technology Counts 2002: E-Defining Education" (2002) reports that schools across the country are evaluating Web-delivered instruction to determine if it delivers as much as it promises. Web-based interventions could offer students in rural areas access to information resources and courses not previously available. Anecdotes support Web-delivered instruction, but more quantitative research is needed. Surveys of teachers and students consistently show that the most effective courses are well-designed, aligned to standards, incorporate valid embedded assessments, allow some time for student interaction, and enable online collaboration with peers and teachers (Cradler & Cradler, 2002). An evaluation of the Hawaii E-School and a review of research on effective online instruction resulted in the development of an assessment tool known as Web-Based Course Indicators (WBCI). The WBCI guides the development of online courses and evaluates the adherence to tested Web-course design principles (Cradler & Cradler, 2000). School districts, colleges, and universities have applied this tool in the evaluation of online learning.

III. Instructional Change. The new requirements for accountability include documentation of the program's effectiveness in supporting technology integration into curriculum and instruction and the intervention's influence on instructional practice. Research is showing that technology can effectively capture information about change in teachers' use of technology. For example, the California Department of Education developed the California Technology Assistance Project/Technology Assessment Profile ($CTAP^2$), a tool for teachers to self-assess their competency in integrating technology into instruction. Typically, teachers complete $CTAP^2$ online before and after staff development. Results are graphically reported online as well. The state recommends that school districts use $CTAP^2$ as part of the overall assessment strategy and to assess the effects of the NCLB-EETT requirement that 25% of the technology funding be used for staff development. (***Editor's note:*** See the online supplement for other examples of online assessments to evaluate technology integration.)

IV. Student Outcomes. Documentation of students' acquisition of technology skills and changes in their academic performance measured against state standards that supports reported learning outcomes is the most important indicator of success for NCLB. The ED guidelines are flexible in terms of how and what instructional interventions are used, as long as student learning improves and is clearly documented with valid assessments.

Technology has promise as an assessment resource. CARET is currently reviewing additional studies related to the use of technology as a vehicle for student assessments. For example, Russell and Haney (1997) found that students who are more comfortable with computers and have used them in school score higher on computerized tests than on paper-and-pencil tests. South Dakota has required statewide online testing. Harding County in South Dakota reports that their online tests adapt to a student's academic ability and that the program instantly illustrates a student's strengths and weaknesses, enabling teachers to individualize instruction. An extensive review of the impact of technology on assessment by Education Testing Service (ETS) concludes that technology, particularly the Internet, will be the major factor for large-scale assessment, comparable to its revolution of commerce and business (Bennett, 2002). (***Editor's note:*** See the online supplement for a list of several commercially available programs providing online student assessments.)

A drawback of commercial packaged assessment applications is that they are difficult or impossible to customize to meet local requirements. Another concern is that most computerized and online tests are limited to multiple choice reporting. Educators need online assessment resources that are customized with assessment items matching local content standards. For this reason, the United States Open e-Learning Consortium (USOeC) is establishing an online-accessible pool of well-designed test items for assessing student understanding (Clements, Ligon, Burt, & Mangino, 2002). With this online service, educators could quickly locate assessment items to incorporate into their lesson plans to identify learning needs of their students. These assessment items are used with a computer-based assessment system to speed up the grading and turnaround of test scores.

V. Assessment and Analysis. Technology applications facilitate accountability and analysis to inform planning decisions. A wide variety of commercial technology applications are available for collecting and analyzing evidence and information from implementation and outcome data sources, while considering contextual and program implementation factors as illustrated in the chart. However, some education agencies, such as the California Student Information System (CSIS), contract for the development of customized systems. Such applications can also support the new reporting requirements under NCLB. Context data showing, for example, that a school district is in a very rural area with significant numbers of migrant students, and prior scores averaging in the bottom quartile of the normal distribution, could be used to adjust the expectation level for the student outcome data. Technology-based management programs can automatically compute, analyze, and report this information to educators electronically and on demand. Technology use can also support the NCLB-required disaggregation of data by student classifications including gender, ethnicity, poverty, disability, English proficiency, and other characteristics. This analysis will identify areas that need to be improved or compensated for when replanning the intervention.

Teacher desktops, online reporting systems, instructional management tools, and electronic lesson builders help analyze student assessment data and other student information related to state and local content standards. These "electronic desktops" inform classroom and individual student instructional plans that use pre-validated, standards-based units, lessons, and activities. They also enable disaggregation

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of student achievement data (by gender, ethnicity, language proficiency, rural/urban residency, for example), and reporting of outcomes to parents, the district, the state, and the ED. Program modifications could then be implemented following the conceptual model described in this article. The electronic desktops can also let users modify or add information and share instructional strategies with colleagues. (*Editor's note:* See "Raise the Bar, Close the Gap, Accept No Excuses" by Lynn Ochs [p.18] for an examination of electronic desktops used in Hamilton County, Ohio, schools.)

Administrators could use the system to make data-driven program and project decisions, evaluate effects of specific interventions, and automatically produce school and district accountability reports for parents and other stakeholders. A recent review of electronic desktops suggests that NCLB will drive the use of instructional management applications in about 10% to 15% of the 16,250 U.S. school systems in the coming year. It further states that districts will find accountability difficult without these applications. More than 50% of all schools are predicted to be using technology-based instructional management applications by 2005, when the testing provision of NCLB takes full effect (Levinson, 2002).

Several public and commercial applications help educators to plan instruction based on student profiles. CRESST developed the Quality School Profile (QSP) as part of a resource kit that enables schools to monitor progress on components of their programs and to aim resources at the school and classroom level. A study funded by the ED found that instruction based on planning with QSP results in improved student learning. *Smart Desktops for Teachers* (Education Commission of the States [ECS], 2000) provides a listing of these "smart" tools.

Anecdotes support Web-delivered instruction, but more quantitative research is needed.

The ECS study defines a smart desktop as a Web-based application that helps teachers:

- find instructional resources correlated to standards;
- create, customize, or access lesson plans juried by their peers;
- create syllabi and activity journals;
- communicate and collaborate with peers;
- store and retrieve information about individual students;
- get "just-in-time" training and professional development;
- conduct ongoing, diagnostic testing;
- use timely information to make school improvement decisions;
- exchange information with parents and students; and
- use productivity tools, such as electronic grade books and calendars.

(*Editor's note:* See the online supplement for more examples of electronic desktop applications and electronic desktops for teachers.)

Conclusion

Technology can play a major role in all aspects of NCLB. First, it can be used to help enable the public and private sectors to conduct research needed to document and provide scientific evidence of the effectiveness of instructional interventions. Second, technology is and will be increasingly used to collect critical student data and program information needed for both instructional planning and analysis of learning outcomes. Third, because NCLB will increase the need to use student information to help guide instructional decisions, technology will be increasingly used to enable data-driven decisions. Fourth, technology will serve as a major vehicle for educator sharing and collaborating about implementation strategies, as well as communicating program implementation progress and effects of programs on student learning to parents and other NCLB stakeholders.

Finally, the use of technology has the potential to save valuable instructional time with the use of selected applications that can enable the alignment of instructional interventions with state academic content standards. However, the cost benefits of using technology as an assessment tool and to manage assessment information have not been clearly documented. CARET will monitor, review, and report on studies of these topics. If you register on the CARET Web site, you will be informed of such reviews. As CARET increases its database of descriptions of interventions that meet the CARET validation criteria, users of CARET will be able to select strategies and resources with evidence of effectiveness in particular educational contexts. CARET also offers an online service for educators and publishers to submit research and evaluation studies for review and for advice on how to strengthen studies to meet the new EBE requirements for effectiveness.

Resources

California Learning Resources Network (CLRN): www.CLRN.org

California Technology Assistance Project/Technology Assessment Profile (CTAP2): http://ctap2.iassessment.org/

Center for Applied Research in Educational Technology (CARET): http://caret.iste.org

Enhancing Education through Technology (EETT): www.ed.gov/legislation/esea02/pg34.html

National Center for Research on Evaluation, Standards, and Student Testing (CRESST): www.cse.ucla.edu

No Child Left Behind (NCLB): www.NoChildLeftBehind.gov

U.S. Department of Education (ED): www.ed.gov

What Works Clearinghouse (in production): www.ed.gov/offices/OERI/whatworks/

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John Cradler is the co-director of the CARET project and president of Educational Support Systems (ESS). He first became involved with technology when working with the South San Francisco Unified School District. In 1974, while looking for a more efficient way to provide reading tutoring for special education students, he discovered a Stanford University project on computer-assisted instruction, which was adapted to support a phonics tutoring project called Success Controlled Optimal Reading Experience (SCORE).

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Checklists and Rubrics for Instructional Content

CEO Forum (2002). *School Technology and Readiness, Year 3 Report: The Power of Digital Learning/Integrating Digital Content.* Washington, DC: Author. Available: www.ceoforum.org/reports.cfm?RID=4.

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Examples of Online Assessments to Evaluate Technology Integration

- A Web-based tool developed by SEIR*Tec and the North Carolina Department of Public Instruction helps school leaders reflect on the progress of an ongoing technology integration project or intervention, think about what is needed to meet project goals, consider strategies for maximizing project impact, and collect and report comparable information across projects (http://www.seirtec.org/publications/propeval.html).

- Technology Integration Progress Gauge is available online, in print, and in the Profiler, from the High Plains Regional Technology Education Consortia (RTEC). Users can complete the online version for an instant assessment of their school's or district's areas of strength and to track progress over time (http://www.seirtec.org/eval.html).
- Several of the Technology Innovation Challenge Grants and Preparing Tomorrows Teachers for Technology Projects have established online assessment tools for of level of use and infusion of technology interventions (www.pt3.org/, and www.ed.gov/Technology/challenge/).
- The National Educational Technology Standards for Teachers (NETS-T) provides comprehensive performance indicators for technology integration into professional development and teacher preparation programs. Indicators cover planning and designing learning environments; teaching, learning, and the curriculum; assessment and evaluation; productivity and professional practice; and more (http://cnets.iste.org/index3.html).

Commercially Available Programs Providing Online Student Assessments

- NCS-Pearson offers diagnostic online tests for grades K–8 in reading and mathematics that measure standards-based skills and provide links from test results to targeted educational resources (http://www.ncs.com/testing/wehelpkids.htm).

- Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) that uses data derived from locally administered computerized tests customized to test the student's achievement level to predict performance on critical state tests. (http://www.nwea.org).
- Performance Assessment Links in Science (PALS) is a continuously updated Web-based database of more than 5,000 science performance assessment tasks aligned with the National Science Standards (http://pals.sri.com/papers/finalreport/).
- Bookette Software Company creates integrated software modules for K–12 schools to develop, administer, score, and report student assessments on the desktop computer (http://bookette.com/pages/about01.htm).

Examples of Electronic Desktop Applications

- NetSchools 'Orion' Teachers use this program to select a desired content standard and then search for correlated web-sites, lesson plans, and customized curriculum activities (http://www.netschools.com/products/orion.htm).
- CLRN's *Lesson Plan Builder:* With this tool teachers can develop standards-aligned technology enhanced lesson plans, share them with peers, and submit them for review and posting on the CLRN web portal. They can also locate model lessons to enable use of existing multimedia and web resources that have been aligned with state standards. (http://clrn.org).

Examples of Electronic Desktops for Teachers

- The American Association of School Administrators Center for Accountability Solutions (CAS) helps educators gather, use, and report data on student, school, and district performance (http://www.aasa.org/cas/).
- Education Commission of the States prepares reports and activities to help policymakers understand NCLB (http://www.ecs.org/ecsmain.asp?page=html/Special/ESEA_main.htm).
- The US Department of Education Web-site includes information on ESEA, links to legislation and press releases and fact sheets on major provisions (http://www.ed.gov/offices/OESE/esea/).