Technology-Based Assessments Improve Teaching and Learning

SETDA

October 2008

2008 Stakeholder Advisory Committee and Roundtable Participants

Jill Abbott, SIFA
Todd Brekhus, PLATO
Christopher Brown, Pearson
Nancy Carey, Maryland
Tera Daniels, SETDA
Tom Dawson, Gates Foundation
Chris Doughtery, National Center for Education Accountability
Geoff Fletcher, 1105 Media
Christine Fox, SETDA
Scott Frien, CCSSO
Jennifer Fritschi, Verizon Foundation
Larry Fruth, SIFA
Rick Gaisford, Utah
Anita Givens, Texas
Aimee Guidera, data Quality Campaign
Sara Hall, SETDA
Wayne Hartschuh, Delaware
Todd Hitchcock, Pearson
Kathy Hurley, Pearson Foundation
Rachel Jones, SETDA
Tom Lindsley, Just4Kids
Jerome Mackey, College Summit
Jeff Mao, Maine
Jayne Moore, Maryland
Mark Nieker, Pearson Foundation
Deborah Newby, U.S. Department of Education
Lan Neugent, Virginia
Steve Normark, NetTrekker
John O'Connell, Iowa
Sandy O'Neil, New Jersey
Joel Petersen, NetTrekker
Lyndsay Pinkus, Alliance for Excellent Education
Melanie Pritchett, Compass Learning
Cathy Poplin, Arizona
Mark Robinson, Promethean World
Ross Santy, U.S. Department of Education
Kimberly Smith, Standard & Poors
Nancy Smith, Data Quality Campaign
Gloria Steele, South Dakota
David Stevenson, Wireless Generation
Patrick Supanc, Pearson
Jon Twing, Pearson
Arie Vanderploeg, Learning Point
Carla Wade, Oregon
Erica Wiggins, Data Quality Campaign
Mary Ann Wolf, SETDA

The State Educational Technology Directors Association (SETDA) is a non-profit, educational association for state technology directors. This paper is part of a series: Class of 2020 Action Plan for Education. For more information please visit www.setda.org.

Executive Summary

Businesses such as UPS and Dell Computer have used the micro-analysis of data to successfully transform business practices and retool the workforce to improve and individualize processes, increasing productivity and customer satisfaction. Our educational system can learn from business and realize the incredible return on investment inherent in building smart database and assessment systems using technology to analyze each student's progress in a timely, personal and relevant manner. Additionally, if done with interoperability and alignment in mind, student data can be generalized and privatized to be used in the state systems to inform policy and school reform efforts.

Through the use of technology, classroom teachers can conduct innovative micro-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. This won't happen without adequate teacher training, IT support to ensure the reports delivered to teachers are relevant and user-friendly, and strong leadership about the importance of data analysis to drive classroom instruction at the school, district, and state levels of the educational system.

This paper highlights some of the innovative approaches in assessing student progress -- addressing deficiencies and providing opportunities for growth in a timely, tailored manner through differentiated instruction. Please note that this paper is not advocating for additional high-stakes tests, instead it suggests that using technology to assess students in a less formalized, yet more personalized, manner can glean benefits for teachers and students alike.

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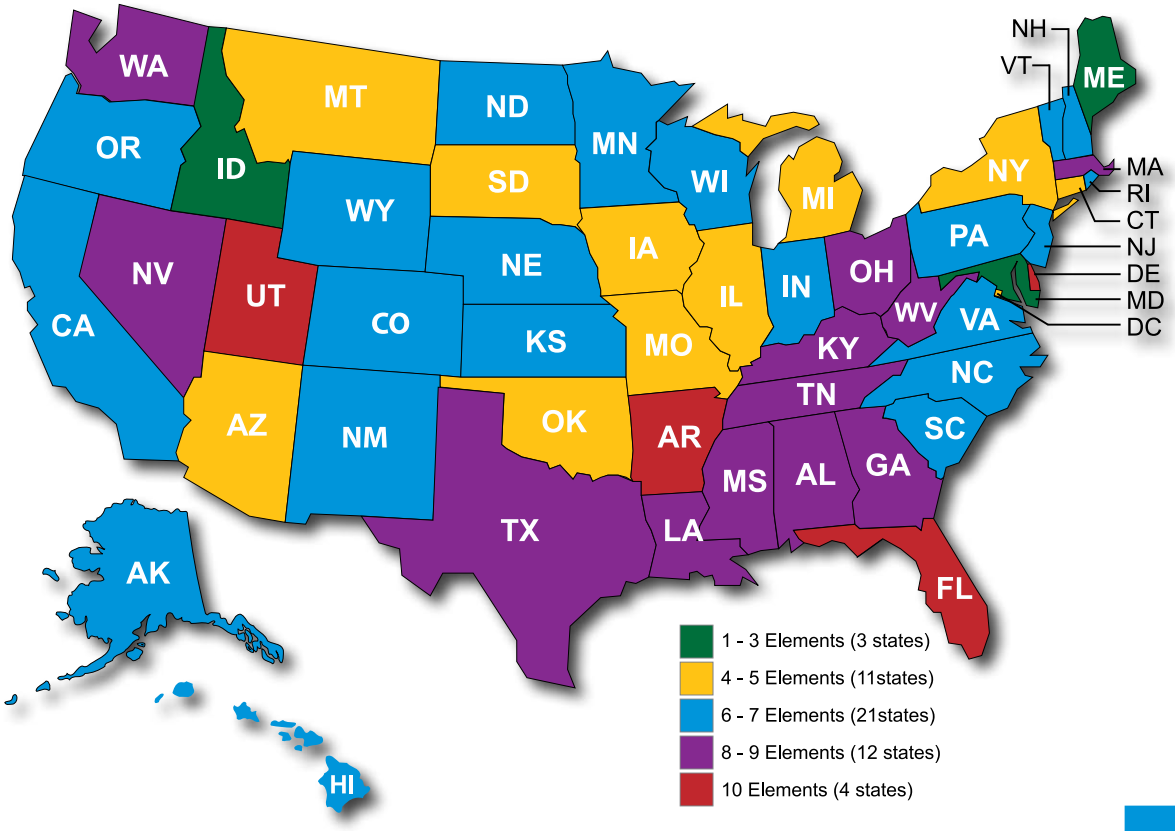
Setting the Context: Data Systems and Assessment

Over the past two decades, new federal and state laws are requiring the nation's schools to focus more on accountability and assessment of student progress. Since the 1994 Improving America's Schools Act (IASA), the federal government has required states to administer at least one end-of-the year test in both reading and mathematics sometime during elementary, middle and high school each. This law, however, included no requirements for minimum student achievement levels. The No Child Left Behind Act of 2001 (NCLB) added a focus on results to these test requirements, requiring states to report on achievement levels for particular racial and ethnic populations as well as special education students. Further, the law mandates that states set their own individual measures of progress — Adequate Yearly Progress (AYP)—toward getting all students and schools to 100 percent proficient in all testing areas by 2014. Because of these federal mandates, most states have been administering standardized tests for more than a decade. Few, however, have yet to collect that data into a comprehensive state longitudinal data system. 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. Exhibit 1 shows states' progress in developing a comprehensive statewide longitudinal data system that includes the 10 essential elements identified by the Data Quality Campaign. Currently, only 16 states have at least 8 of the required elements.

2007 DQC/NCEA Survey about State Longitudinal Systems



Statewide longitudinal data systems are crucial for accountability and to provide comparative data across district and state lines to ensure all students are receiving relevant instruction aligned to baseline academic standards. As the bipartisan Commission on No Child Left Behind described in their report, the data in these systems "provide considerable information to parents, community members, and state and national officials about school performance. They are vital to ensuring that schools are accountable for the achievement of all students. They help schools examine their curriculum and instructional programs and point to areas that need improvement."[1] However, state systems are not designed to drill down to the student and teacher level for the purpose of addressing teacher quality or individualize instruction. Each state should redefine its role of "Data Compliance Officer" to "Data Leader" — using data to improve education at all levels. States must 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.

What are Assessments?

Black and Wiliam define assessments broadly to include "all those activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged."[2] Activities may include classroom observation, class discussions, quizzes, homework, and tests.

Formative vs. Summative Assessment

Summative Assessment

Summative assessments, often referred to as assessments *of* learning, provide a snapshot in time about what students have learned and occur at the end of a unit of study, quarter, or school year. In the classroom, teachers typically assess students by giving tests and projects for specific topic areas. Generally, students receive a grade or score for the assessment based upon an expected standard. Summative assessments are used by teachers and administrators to determine the effectiveness of new programs; whether schools are making adequate yearly progress towards school improvement goals; to compare schools and districts; and for accountability. State assessment tests are designed to provide data to administrators, teachers, students, and parents about student achievement based upon state curriculum standards.

Key Attributes of Summative Assessments

- Occurs at the end of learning
- Letter grades or scores are given
- Measures student achievement with an expected standard
- Results communicated to students, parents, and administrators
- Provides accountability

Formative Assessment

Formative assessment, often called assessments *for* learning, occurs throughout the learning process and is considered formative when teachers use the results of the assessment to alter teaching and learning. The goal of formative assessment is to encourage continuous learning on a day-to-day basis. Formative assessment enables teachers to adapt instruction and instructional methods based upon real-time data, which has an immediate positive benefit for student learning. Teachers conduct diagnostic assessments, a form of formative assessment, *before* teaching a new concept to determine what students know about a particular topic area. Diagnostic assessments are used to inform instruction at the beginning of the learning process, whereas formative assessments are used to inform instruction throughout the learning process. Formative assessment is an on-going process that requires frequent testing and evaluation; however, it is not *intended* to provide grades or test results, rather to change instruction based upon individual student needs. Formative assessment is any classroom activity that helps students answer the following three questions.[3]

- Where am I going? (goals, targets)
- Where am I now?
- How can I close the gap? (feedback)

With formative assessment, students can monitor their current progress so they can manage and modify their own learning.[4] When students and teachers use a collaborative process, students are more likely to take ownership for their education. Timely feedback, which may be written or verbal, between the teacher and student is essential. Constructive feedback helps students realize what gaps exist between "where I am now" and "where am I going". Formative assessment leads to individualizing instruction which supports all students' learning styles and abilities, leading to improved student success.

Key Attributes of Formative Assessment

- Occurs throughout the learning process
- On-going, frequent assessments
- Teachers individualize instruction based upon assessment
- Timely feedback between teacher and student
- Student ownership of own learning

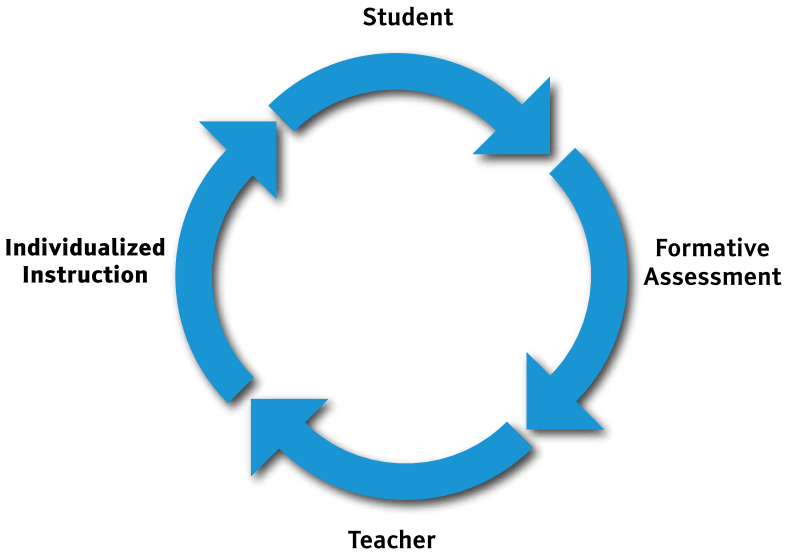
Why Formative Assessment is Important

Timely information about individual students is a critical component for improving the way that teachers teach and students learn. Further, it is essential to ensure that students are continually learning and progressing throughout the school year — within a lesson as well as between lessons. Teachers need access to data to assess the progress of

Individualized instruction enables students with different learning styles to succeed in the same classroom with instruction that is tailored to their needs.

their students on a regular basis in order to individualize instruction, allowing for remediation or enrichment as needed, for each and every student.

Many schools and districts that have shown strong gains in student achievement, are utilizing low-stakes formative assessments --"fine-grained diagnostic information that helps teachers and parents understand what individual students know and can do and suggests appropriate corrections (Bass and Glaser 2004)—throughout the school year."[5] Black and Wiliam conducted an extensive research review to determine whether formative assessment raises academic standards in the classroom. Based upon their research, strengthening formative assessment practices in the classroom produces significant learning gains with effect sizes ranging between .4 and .7 when comparing the average improvements in the test scores of the students involved in formative assessment with the range of scores found for typical groups of students on the same tests.[6] Formative assessment also helps low-achieving students, including students with learning disabilities, even more than it helps other students.[7]



Student success in elementary school provides the foundation for learning throughout life and is a predictor of future success in school. Students who are struggling to read and are behind one grade level in third grade are more likely to drop out of high school. According to a February 2006 report from the Alliance for Excellence in Education on Adolescent Literacy, approximately eight million students in grades 4-12 struggle to read at grade level, and 70% of middle and high school students require additional instructional support.[8] Administrators cannot wait for the annual results from state standardized tests to see if students are mastering the required concepts and whether they are achieving their school improvement goals. Teachers cannot wait weeks to discover that there is a gap in student understanding. Teachers need to conduct formative assessments regularly to ensure student understanding, growth, and progress. Formative assessments are NOT about high-stakes accountability testing – instead - formative assessments are about individualizing instruction so that all students are achieving their highest potential.

Current and Emerging Assessment Trends

Online Assessments:
Schools and school systems are using online assessments through secure network connections to assess student understanding of content regardless of the delivery methodology. In 2007, 30.4% of school districts reported using online assessments in schools.[9] Online assessments are being used for a variety of purposes: for low stakes testing that provides feedback to the student or teacher, in summative context for student grade promotion, and, in some cases, to facilitate state standardized achievement tests. These assessments often use multiple choice, limited response questions that allow for real-time, automated scoring and aggregation of results that can be analyzed in a timely fashion. Because of the varied usage, online assessments have been developed by a variety of sources—local participants in the classroom, district and state educational agencies, as well as private companies with commercial interest.

Virginia's Web-based Standards of Learning (SOL) Technology Initiative
This initiative started with the goal of having schools use Web-based systems to improve the instructional, remedial and testing capabilities of Virginia's Standards of Learning (SOL) state achievement tests. To meet this end, the state hopes to administer all SOL tests via the Internet by 2009. The state identified four major benchmarks schools must meet in order to fully administer an online, state testing program. Each school must:

1. Provide student access to computers at a ratio of one computer for every five students;
2. Create Internet-ready local area network capability in every school;
3. Assure adequate high-speed, high-bandwidth capability for instructional, remedial, and testing needs; and
4. Establish a statewide Web-based SOL test delivery system.

The online version of the test is exactly the same as paper-pencil version of the test; the format is the only aspect that differs. The administrative benefits gained from delivering online SOL tests include less administrative time required to record student demographic data; improved test monitoring capabilities; web-based reporting of student test results and reduced turnaround time to receive student test scores resulting in potential increases in instructional time.

Portfolio Assessment:

Portfolio assessment allows for evaluation of student achievement through a repository of student-created artifacts that are gathered over an extended period of time, whereby the student has made decisions about selecting and organizing the work and has reflected upon the individual products within the portfolio as well as the package of material as a whole.[10] Typically, the pieces included in a portfolio represent finished products rather than in-process documents. Because portfolios contain multiple products taken from different points in time, they allow for the demonstration of student growth over that period of time (e.g., a school year). Some feel that, because portfolios provide multiple representations of a student's work, this type of assessment allows teachers, students and parents to gain a much "richer" understanding of what students know and understand relative to other types of assessments.[11] Technology is integral to the effectiveness of portfolio assessment as it allows for the creation and sharing of a portfolio from within and out of a school.

The South Carolina ePortfolio System

This assessment addresses the technology needs of all K-8 South Carolina students by establishing a system that measures technology proficiency of students with online assessments; prescribes resources for students; and demonstrates technology skills through the creation of electronic portfolios aligned with the 2007 NETS Standards. To determine technology levels, each student completes pre and post assessment(s). These assessments help educators determine students' knowledge of various technology software tools (i.e., word processing, spreadsheets, Internet, etc.) To ensure that all students stay current with technology, the Office of eLearning provides students with technology resources based on skills. To demonstrate technology proficiency, all students are required to complete an electronic portfolio. The technology portfolio will contain presentations, spreadsheet activities, and research projects/newsletters/or web pages demonstrating technology competency. In order to meet the NCLB requirements, associates in the Office of eLearning collaborated with teachers, media specialists, instructional coaches, and administrators in creating the Student ePortfolio System.

Current and Emerging Assessment Trends

Blended Assessments

With the burgeoning global economy, many agree that it is essential for our nation's students to be proficient in 21st Century Skills in order to be competitive in the marketplace. The Partnership for 21st Century Skills, the leading organization on this topic, has identified four key areas of skills for students beyond core subject areas that comprise a 21st Century Education:

- 21st Century Content (e.g., global awareness)
- Learning and Thinking Skills (e.g., collaboration, creativity)
- Information and Technology Literacy
- Life Skills (e.g., Leadership, Adaptability).[12]

Because of the abstract nature of these skills and the fact that many do not clearly fit into one core content area, they prove difficult to assess in a common standardized fashion. Thus, instead, many states, districts and schools are utilizing authentic, project-based assessments either on their own or embedded in core subject area assessments to test competency in these skills.

NAEP Test: Problem-Solving in a Technology-Rich Environment (TRE)
In this pilot test, students' mastery of 21st Century skills was embedded within a physical science assessment for the National Assessment of Education Progress (NAEP). On the assessment, students were given two extended scenarios within the domain of physical science that were created for measuring students' ability to solve problems using technology. The assessment required students to search the Internet, using a simulated world wide web environment, and to 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 taken into the schools. The purpose was to use technology to measure skills that cannot be easily measured by conventional paper-and-pencil means. The assessment produced a total score and separate scores for scientific inquiry, computer skills, scientific exploration, scientific synthesis, and computer skills.

Performance Assessments

Performance assessment—sometimes called authentic or project-based assessment—requires student demonstration of a skill set either through series of actions or development of a product in order to prove competency. This type of assessment presumes that product completion can only be accomplished by the student knowing and understanding the series of embedded skills being assessed. Performance assessment can be used for both formative and summative purposes. Technology can facilitate performance assessment by creating simulations of projects or activities that require, in accurate fashion, the same behavioral procedure and choices as the real-life situation.

McKinley Technology High School, Washington, DC

High school students at McKinley Technology High School in Washington, DC, specialize in one of three technology-focused areas: bio-technology, broadcast technology and information technology. Broadcast teachers work with language arts teachers to create performance assessments that require students to showcase both their broadcast and language arts skills. High school juniors learning how to formulate persuasive arguments in their language arts classes and audio production in their broadcast classes were required to create a radio advertisement aimed at persuading their audience toward a particular viewpoint. Students were required to script, record, produce and air their radio advertisements.

Technology Supports Assessment that Improves Teaching and Learning

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 hand written records and paper copies of classroom assessments are quickly fading into the 20th century. With the increased curriculum content to cover, teachers do not have the time to utilize paper methods for formative assessment when there are a wide variety of technology tools available. Handheld devices for reading assessment, electronic response systems, and software are all technology-based formative assessment tools that have the power to help each teacher effectively individualize instruction for all students. Blogs, chats, and Wikis used in the classroom environment help teachers gain an understanding of what students know or don't know. Many districts and states are utilizing 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 upon abilities and needs. Highlighted below are a few examples from states and districts using technology-based formative 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.

Alaska's GLE Item Sampler

The Formative Assessment GLE Item Sampler is a statewide effort to develop a bank of formative assessments aligned to the Alaska Grade Level Expectations in math, reading, and writing for grades 3-10. 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.

Arizona's Formative Assessment Item-Bank

Arizona offers a formative assessment item-bank with more than 5,500 items aligned to Arizona standards located within their IDEAL (Integrated Data to Enhance Arizona's Learning) web portal http://www.ideal.azed.gov. They also have more than 100 pre-made pre and post assessments and performance objective snapshots aligned to Arizona Standards available to all teachers in Arizona.

Pennsylvania Value-Added Assessment System (PVAAS)

The Pennsylvania Department of Education recently launched the Pennsylvania Value-Added Assessment System (PVAAS) Evaluating Growth, Projecting Performance. Districts and schools are using progress data, in conjunction with achievement data, to ensure all students are on the track to proficiency. This comprehensive system, allows all Pennsylvania educators to utilize progress and achievement data so that they are able to make data-informed instructional decisions.

Texas TAKS

Texas utilizes the PLATO State Test Results Import Utility 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 the objectives that were not mastered on the state test. Optional progress assessments may be administered during the year allowing 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 the year to gauge student progress and readiness for the next grade level.

Virginia's Algebra Readiness Initiative (ARI)

Virginia's Algebra Readiness Initiative (ARI) assists in preparing students for success in algebra through a computer-adaptive test (CAT). School divisions are eligible for incentive payments to provide mathematics intervention services to students in grades 6-9 who are at-risk of failing the Algebra I end-of-course test based upon diagnostic tests. The diagnostic test results allow teachers to individualize the content for intervention. A pilot study conducted during the 2005-2006 school year to explore the efficacy of this approach in grade 5 showed that students improved over 80 scale score points between the pre and post Algebra Diagnostic Test during the school year. Teachers reported that the ARI helped determine the learning styles of the students and ultimately modified the teaching accordingly. Some students like formulas, while others relate to examples, scenarios, and hands-on activities.

Washington State Measures of Academic Progress

A number of districts in Washington are using the Measures of Academic Progress (MAP) level test, a state-aligned computerized adaptive assessment program that provides educators with the information they need to improve teaching and learning. Educators use the growth and achievement data from MAP to develop targeted instructional strategies and to plan school improvement. For more information, please see: http://www.nwea.org/assessments/map.asp.

Fox Chapel Area School District Pennsylvania

A small school district with students from urban, suburban, rural, and coal-mining communities is focused on individualizing instruction for all students. The district adopted 4Sight, a benchmark tool developed at Johns Hopkins University as part of the Success for All program. With multiple assessments given throughout the year, principals had access to critical data through the 4Sight member center. The information proved invaluable in helping teachers work as teams to engage in meaningful discussions. Teacher cohorts in the middle school use data analysis of the 4Sight benchmarks to identify students who have a weakness in "anchors", core standards required for development. Through item analysis, they identify the skills required to achieve the anchors and then build lessons for small groups of students or individuals. The culture of the school has changed from a focus on classes to small groups and individualized instruction with deep conversations among educators.

> *"A University of Pittsburgh study on teachers' attitudes toward data showed that they want to use data and understand the importance, but the problem is getting appropriate data for individual instruction."*
> -Norton Gusky, Coordinator of Educational Technology

Indianapolis Public Schools, Indiana

Beginning in the 2007-2008 school year, Indianapolis Public Schools adopted an edition of Wireless Generation's mCLASS:DIBELS software and reporting platform that fully integrates their current core curriculum basal with formative assessment data, helping to take data-driven decision-making even further by providing its teachers with explicit support in using individual student data to pinpoint appropriate and effective basal lessons. By creating a strong link between the mCLASS:DIBELS 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 over year. During the 2007-2008 school year, data reveals 49% of K-3 students identified as being at high risk for reading difficulty at the beginning of year left the high risk category by the end of the year, with 27% of those students reading at or above Benchmark level; in addition, 46% of students identified as being at some risk for reading difficulty were reading at Benchmark by the end of the year.

Seminole County School District, Florida

In Seminole County, Florida the district purchased handheld devices to conduct the DIBELS reading assessments in 2004. Scores are delivered in real-time, and after a button is pushed to sync the device, data is transferred to a secure Web platform that provides tools for analysis and data-driven instructional decision making. In addition,

teachers, principals, and administrators can access a range of easy-to-read reports designed to deliver the data views educators need to track progress and understand what resources and strategies are most effectively improving student outcomes. For the last five years, this focused system of data collection, analysis and intervention has led the entire Seminole County school district with 36 elementary schools to an "A" ranking according to the Florida Department of Education.

> *"We are able to serve every student on his or her level. Our benchmark students receive acceleration – they are on the computer, researching planets, and then writing stories about imaginary planets. These are things teachers would never have time to do if they were not individualizing and differentiating instruction based on assessment data."*
>
> -Debbie Warner, Coordinator of Elementary Reading and Curriculum for Seminole County

St. Mary's Parish, Louisiana

In St. Mary's Parish in Louisiana, the district found that the combination of an online formative assessment tool and online, standards based resources have positively impacted student achievement. These tools allowed educators to identify a student's area of deficiency and then go immediately into the online database (NetTrekker d.i). and quickly and easily find supporting resources for each child at his/her individual learning level.

Taylor Public Schools, Michigan

Taylor Public Schools has effectively implemented this program, and as a result, student achievement in mathematics has dramatically increased. In years past, Taylor has selected those higher achieving students out of 8th grade to take Algebra 1 in 9th grade. Historically the failure rate for those "high achieving" students came in around 45%. This school year, ALL 9th graders were required to take Algebra 1, including Special Education students, and the failure rate has decreased to 15%-20%.

Vallejo Middle Schools, California

In the 6th and 7th grades in Franklin Middle, Solano Middle, Springstowne Middle, and Vallejo Middle Schools, teachers are trained to integrate technology into the classroom to engage students and improve student achievement. Vallejo focuses on the lowest performing students, individualize instruction in 6th and 7th grade, where students don't typically engage in the learning environment. Teachers utilizes a game show/class quiz format to engage students and review content. Students love using technology in this format and teachers are getting instant feedback on what concepts the students have mastered. This instant feedback strengthens the teaching and provides the data necessary to individualize instruction. The Vallejo district saw large gains on CST scores for the target students, the 50 lowest-performing students in each middle school. Approximately 40% moved up one performance band in the first year and the two-year objective was met in the first year.

Barriers to Conducting Formative Assessments

Technology Infrastructure

- Most school districts and states lack sufficient technology for broad-based implementation of formative assessment.
- Many school districts lack adequate high-speed broadband access, necessary for many assessments.

Teacher Training

- Most teachers have inadequate training to use data and be assessment-literate.
- In order to be effective, teachers must be able to analyze the data produced by the assessments. Many teachers, however, have not received this training either in pre-service or in-service coursework.

Lack of Classroom Time for Assessment Analysis and Re-teaching

- In the current NCLB-centered climate, most teachers feel a tremendous amount of pressure to cover the state- or district-required material. This leaves little to no time to conduct formative assessments and re-teach elements of the curriculum.

Curriculum

- Teachers feel pressure to teach everyone in the classroom as a unit, so everyone is on the same page.
- Current standards based curriculum 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) results in not being able to address gaps in understanding revealed by formative assessment.
- The cost in time and effort to administer the assessments often hinders the potential benefits.

Current Assessment Norms

- The idea of test that is carried out at the end of a section of work is embedded in the current standards-based system as the only way to administer assessment.
- Most current understanding assumed that there is only one procedure to administer a test--paper based tests. You can assess using handheld devices at any time.
- In the current system, teachers are generally separated from the process of assessment, especially given the focus on high-stakes standardized tests.
- Traditional assessment tends to assess “high order concepts” by asking students “low order questions” after the event.

Key Recommendations

Leadership

- Incorporate innovative, consistent and timely assessments into daily instruction.
- Ensure sufficient technology infrastructure and technical support are available to all teachers and administrators.
- Create new instructional design principles for engaging diverse student capabilities and needs.
- Provide teacher training for the proper uses of data to improve teaching to ensure each child's potential is reached.
- Provide leadership from the federal, state, and district regarding teachers' use of data as a "carrot and not a stick."
- Use technology and formative assessment to strengthen the home and school connection by communicating with parents on student progress.
- Provide a separate funding stream to support leadership and teacher training regarding the use of data to change teaching practices.

Technology Infrastructure

- Ensure the data flowing into the classroom for the improvement of instruction is user-friendly, timely, and accurate.
- Ensure that computers and other technologies are used continuously and seamlessly in instruction & assessment.
- Ensure software is available and scheduled in such a way to ensure easy access to quality tutoring for all students.
- Use technology to immediately post results on the state's electronic management system for transferability of transcript for analysis at the state, school and classroom levels.

Endnotes

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