Results in the Palms of Their Hands: Using Handheld Computers to Support Data-Driven Decision Making[1]

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INTRODUCTION

Since the No Child Left Behind (NCLB) Act passed in 2001, the idea of using data has become pervasive within school systems. While educational leaders around the nation are pushing for multiple stakeholders to utilize standardized assessment data when making decisions on multiple levels of the educational system, the task of actually providing teachers with student-level data, which they can use within the context of instruction, has nonetheless remained a challenge. Difficulties arise in the states' and districts' ability to provide data, which meet a series of requirements. According to research, for teachers to be able to use data within their practice, the data must have the following qualities: 1) be specific enough for teachers to see where students need help; 2) be accessible in a timely manner so that teachers are able to act upon the information; and, 3) be comprehensible enough to be translated into practice. All too often, the current approaches to assessment, as well as the data collected and distributed, do not meet these criteria (Popham, 1999; Schmoker, 2000). While teachers have long used a range of teacher-made and commercially published assessments, traditionally they have not used the results from the kind of standardized assessments, which they are now expected to use in instructional decision-making to make classroom-based decisions (Thorn, 2002), thus making it difficult to understand and consequently use these types of data. Moreover, there is typically a six-month lag time between when a standardized assessment is administered and when teachers receive the results, making the data, as many refer to them, "DOA" or "dead on arrival." Supplying teachers with data that are relevant, aligned to instructional goals, immediate, and easy-to-read is therefore no easy task.

Wanting to provide teachers with data that meet these criteria, educational leaders have been turning to technology-based solutions for help in meeting these goals. One such solution that is gaining in popularity around the country is the handheld computer technology and corresponding mCLASS (for Mobile Classroom Assessment) platform offered by the commercial company, Wireless Generation™. With software that provides teachers the option to choose from an array of standardized early literacy assessments, as well as easy-to-read graphics of students' results all accessible on handheld devices and desktop computers, Wireless Generation™ aims to make student-level data available to teachers so that they ultimately can use the data when making decisions about their students and their instructional practice. In

this paper, we will share information, based on data collected from two studies conducted by the Education Development Center's Center for Children and Technology (EDC/CCT) about how educators are implementing the Wireless tools; how teachers are actually using the tools to assist struggling students and shift their instructional practice; how facets of the technology assist in supporting data-driven decision making within the context of teaching and learning; the challenges associated with implementing the technology and using the data; and, finally, ideas about next steps and further research.

HANDHELDS AS FORMATIVE ASSESSMENT DEVICES

While using handheld computers to administer assessments and view data is becoming increasingly popular, few studies that examine the effect they have on teacher practice and student achievement exist (Brunner & Honey, 2001; Hupert, Martin, Heinze, Kanaya, & Perez, 2004; Sharp, 2004; Sharp & Risko, 2003). Studies that have begun to explore this phenomenon suggest that that these tools assist teachers in thinking more substantively about students' academic achievement and progress. As a whole, the research indicates that the single most powerful affordance of the technology is its ability to support teachers in using assessments to acquire information about students' thinking and learning, and to use the understanding gained to further shape their instructional practice (Brunner & Honey, 2001; Hupert et al., 2004; Sharp & Risko, 2003). Such a strategy has the potential to place assessment squarely in the center of the classroom where it conceivably could count the most.

According to the Quality Education Data (2004), 55 percent of the nation's school districts used personal digital assistants (PDAs) or handheld computers in US public schools in 2002-2003, and an additional eight percent were expected to purchase them for use during the 2003-2004 school year. The numbers released by Wireless Generation™[2], however, reveal an even greater increase in the widespread adoption of these tools. During the fall of 2005, Wireless estimates that roughly 80,000 teachers working in 48 states will be using their products to collect and analyze data for up to one million students in pre-K through sixth grade. The company currently has contracts with ten Reading First states, as well as with some of the largest school districts in the nation, including the New York City Board of Education and Chicago Public Schools.

[2] These data comes from Wireless Generation™'s web site: http://wirelessgeneration.com/web/.

THE TOOL

In 2000, Wireless Generation™ began offering the mCLASS platform, developed for use on handheld computers. With the handheld technology and the mCLASS platform, teachers are able to give one of several early literary assessments, such the Dynamic Indicator of Basic Skills (DIBELS®) and the Texas Primary Reading Inventory (TPRI®). After administering the assessment to students one-on-one, teachers are able to view the results on their handheld computers immediately, and in several different formats, including various charts and graphs. Teachers who are participating in both of the studies, on which we will be reporting, are using the DIBELS®, a screening developed by Dr. Roland Good and a team of researchers at the University of Oregon (Good & Kaminski, 2002). The DIBELS® is based on an essential set of skills deemed necessary for children to become fluent and purposeful readers, and is made up of a series of timed tasks that vary depending on a students' grade level and when the test is administered during the school year. The DIBELS® is made up of multiple subtests which address several early reading skills. They are: Initial Sound Fluency (ISF), Letter Naming Fluency (LNF), Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), and Word Use Fluency (WUF), and is to be administered during three benchmark periods throughout the school year – in the fall, in the winter and in the spring. During the 2004-05 school year, an estimated 7865 schools within 2447 districts in 49 states and Canada used the DIBELS® to assess over 1.7 million students, Kindergarten through 3rd grade.

Once teachers receive the handheld computers, they can view their class roster. They can then tap their stylus on a student's name, and quickly see, on which subtests that students needs to be tested (see Figure 1). After a student has taken the DIBELS®, he or she is placed in one of three recommendation categories based on their performance on the subtests that are appropriate for his or her grade level. These three categories describe the level of support recommended for students to attain grade level reading proficiency. After taking the DIBELS®, students are either classified as Benchmark – progressing on grade level; Strategic – in need of additional help; or, Intensive – at-risk of reading failure. In addition to the three benchmark periods, teachers have the option of continuously monitoring students using the progress monitoring function, which keeps track of how many words per minute (wpm) a student reads – an indicator of fluency. Teachers may use this feature as often as every two weeks if they are concerned about the progress of particular child. Though some educators question the DIBELS®' validity and reliability,

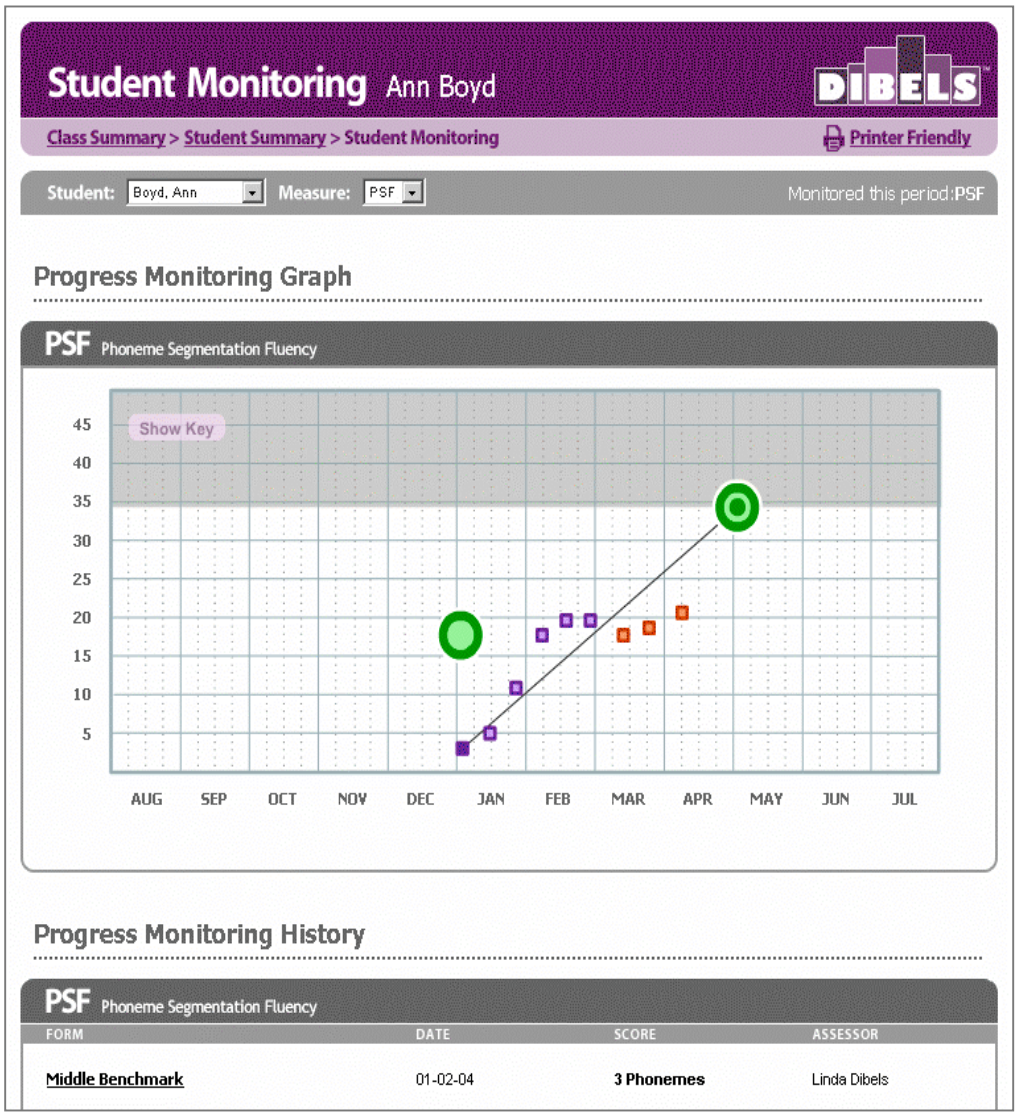
specifically as a means for measuring comprehension, almost every state receiving Reading First (RF) funds is using it currently to assess students participating in the program. By having the DIBELS® along with various other early literacy assessments on the handheld computers, teachers have an alternative vehicle for administering the screening, monitoring a student's progress and viewing class and individual student data.

Figure 1: Screen shots on the handhelds: a sample class list, and a DIBELS® review.

Figure 2: A student's Phonemic Segmentation Fluency (PSF) results. Note the "running man," which denotes where the student is in terms of the different risk levels.

Once having given the assessment, teachers have several options for viewing students' results. Immediately after a teacher has completed the assessment, a screen showing whether the student is designated 'high', 'some', or 'low' risk on a specified subtest appears (see Figure 2). From there, the teacher can navigate her way to a screen with a graph, which displays an individual student's progress or lack thereof in relation to existing benchmarks. Teachers complete the data collection process by uploading the data at an electronic syncing station (this is a cradle for the handheld computer that connects to a desktop or laptop using a USB connection) after they have given each benchmark exam. Typically, school administrators designate a central computer station, located in the school's computer lab, reading resource room or media center, where teachers can easily and efficiently sync the data. Once the data are uploaded, anyone who has access, can manipulate the data so as to view them on the student, classroom, grade or school level. From the website, teachers can also access a series of different kinds of reports, including student and class-level summaries (see Figure 3).

Figure 3: Presentation of the Phoneme Segmentation Fluency, a sub-test of the DIBELS®, results for a sample student. The green circles represent the benchmarks.



THE CONTEXT

Much of the information presented in this paper comes from an ongoing evaluation of the Reading First (RF) Initiative in New Mexico conducted by EDC/CCT. New Mexico Reading First (NMRF) began in July of 2003 when the State of New Mexico joined a small group of early implementers awarded funds by the US Department of Education. After receiving the monies, state education officials continued to worked closely with RF program officers to craft a program that followed federal guidelines for the implementation of a comprehensive, research-based reading initiative, the primary goal of which was for all students to attain grade-level proficiency in reading by the third grade.

Like many other states across the country serving a large number of students who are labeled at risk for reading failure, New Mexico lacked a sound infrastructure for supporting the regular administration of an assessment that could provide teachers with continuous and timely student-level data. Recognizing that RF offered them not only a unique opportunity to support literacy instruction, but also a way to collect and use data in a standardized fashion, state education officials contracted with Wireless Generation™ to purchase handheld computers and the corresponding mCLASS platform for every teacher participating in NMRF. The hope of NMRF leaders was that with the Wireless tools, teachers would be able to efficiently administer the DIBELS® assessment to students one-on-one, immediately view the results and then upload the data to a desk-top computer, from where they could visit a website and see the data in easy-to-read graphic form by either the individual student, classroom, grade or school level.

During the first year of the program, roughly 500 Kindergarten through third-grade teachers working in the 32 NMRF schools located within ten different districts across the state administered the DIBELS® during three assessment windows throughout the school year – fall, winter and spring. For the vast majority of teachers, this represented their first exposure not only to using the handheld technology, but also to participating in a state-wide assessment system. For the program's second year, New Mexico expanded the NMRF initiative to 91 schools within 32 of the state's 89 total districts, maintaining the same requirements for administering the DIBELS® assessment. The state, however, left decisions about exactly how the assessments would be administered up to the local districts. Nearly all of the ten districts that participated in the first year of NMRF decided to continue using the handheld computers to administer the DIBELS® during their second year of implementation. Nineteen of the 22 districts that joined NMRF in

the second year chose to do the same, purchasing the Wireless tools for all participating RF teachers. Only three districts decided to administer the DIBELS® using the pencil/paper version, enter the data themselves and then view aggregated results and reports on the University of Oregon's website. Similar to Wireless Generation's™ mCLASS platform, the University of Oregon makes the data available in a variety of different formats, including graphs and tables, which show both student, classroom, and in the case of the University of Oregon, school and district level data.

A year and a half after EDC/CCT's evaluation of NMRF, which promised a closer look at the implementation of the Wireless tools, EDC/CCT was awarded a grant from the National Science Foundation (NSF) for a research project titled, "Evaluation Framework for Data-Driven Instructional Decision-Making." The project, which began in December 2003 and continues through November 2006, has two primary goals: 1) to build a knowledge base about how schools use data and technology tools to make informed decisions about instruction, and 2) to develop an evaluation framework capable of examining the complexities of this phenomenon. To achieve these goals, researchers chose six school districts where using data was being made a priority, as well as where one or more technology-based solutions that purport to support the use of data on multiple levels of schooling, were being implemented. Out of these six cases, three of the districts - Chicago Public Schools (CPS), the Albuquerque Public Schools (APS), and the Mamaroneck School District in New York State – purchased the Wireless Generation™ tools to administer early literacy assessments to all Kindergarten through third grade students in RF schools within APS and CPS districts.

In this paper we will share findings primarily from data collected during the first two years of the NMRF evaluation. Because data collection for the NSF study is still in progress, these findings remain preliminary. Throughout both years of the NMRF evaluation, we conducted interviews with classroom teachers, school building level administrators, RF coordinators working on the district level and, where present, instructional or literacy coaches at school and district offices regarding their use of the handheld computers and the resulting data. We also conducted a series of observations that took place during site visits to a sample of NMRF schools. Observations of classroom teachers, who were using the DIBELS®' progress monitoring feature to assess struggling students, helped us to better understand how teachers were implementing the technology and using the data. (see Figure 4). In addition, in the late spring of both years

of the evaluation we sent surveys, which included questions particular to the use of the handhelds and the DIBELS® data, to all participating NMRF teachers and school building level administrators. There was a 74 percent response rate for teachers, and an 83 percent response rate for administrators.

Figure 4: NMRF Site Visit Summary as of June 2005

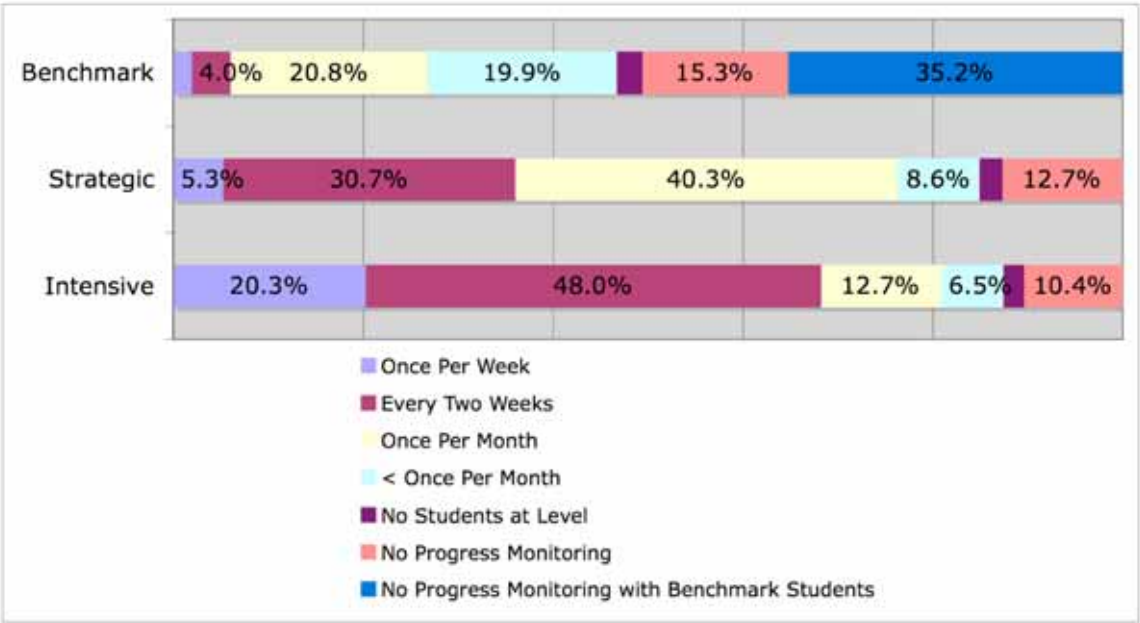
District Visits	School Visits	Observations conducted during . . .		Interviews Conducted		
36	61	67		187		
		Reading Block		**Administrative Staff**		**Teachers**
		61		132		55
		20	Kinder	45	Project Directors	
		28	1st grade	35	Principals	
		9	2nd grade	52	Literacy Coach	
		2	3rd grade			
		2	Mixed grades			
		Other Related Activities				
		6	Progress Monitoring, Literacy Coach or Grade-Level Meetings			

THE IMPLEMENTATION

The implementation of the Wireless tools, most notably in NMRF schools, occurred with relative ease. In all of the sites, teachers generally embraced the handheld technology, expressing enthusiasm and appreciation regarding its ease of use and time saving qualities. In fact, many teachers noted that even the most technophobic of teachers on staff incorporated the technology into their practice with few complaints. Said one teacher, "I understand my students more…everybody should have the Palm. We were afraid of them when we first got them, but now I use it all the time." While the majority of teachers in New Mexico administered the DIBELS® during the three required benchmark periods, they also used the handhelds to monitor students' progress between each of the benchmark administrations. Nearly 70 percent of those teachers who participated in the NMRF survey claimed to progress monitor the Intensive students in their classes at least once every two weeks; 35 percent monitor their Strategic students at least once every two weeks; and, almost six percent monitor their Benchmark students at least once every two weeks (see Figure 6). At many RF schools, teachers probed even further, using the handhelds to administer a diagnostic test

like the TPRI® so they could pinpoint exactly what a child is struggling with, as well as where they could target instruction.

Figure 5: Frequency of progress monitoring for students at different support levels.



While NMRF teachers spent much of the first year of implementation becoming comfortable with using the handheld computers, administering the DIBELS® and interpreting the results, it was during the second year when the majority of teachers actually began thinking about using the data yielded to inform instructional decision making. In New Mexico, almost all of the teachers who took the survey (95.4 %) indicated that they use assessment data to guide instruction.

ANALYSIS

Several aspects of the Wireless tools contributed to teachers being able to both embrace the handheld technology and use the data to shift and improve their practice. From the data collected, we identified four facets of the handheld technology and corresponding mCLASS platform that support the tools' use within the context of teachers' work in the classroom. They include: 1) the efficiency that the technology provides, 2) the tight feedback loop between the administration of the assessment and the

reception of the data, 3) the easy access to the data; and, 4) the comprehensibility and the specificity of the data.

Efficiency of the Technology

During interviews, educators repeatedly noted that using the handheld computers to administer the DIBELS® rather than doing so using pencil and paper, was simply "faster" and easier to manage. Through both observing administrations of the assessment and hearing educators explain the process, it was apparent that with the handhelds, teachers did not have to juggle papers, pencil and a timer, nor identify the subtests, which students are required to take, thus making the whole process more efficient. Additionally, we heard from some of the teachers participating in the first year of NMRF, who had to give the first benchmark test in the fall using paper and pencil because certain districts and schools did not receive the handheld computers in time for the first administration, that entering data was an arduous and time consuming process made obsolete by using the technology. While it is easy to dismiss increased efficiency as a potential benefit when discussing larger educational goals, such as having all children read at grade level by the third grade, it can be a significant factor in whether or not teachers implement and maintain the use of a new tool within their practice.

Educators, ranging from those at district offices to those in classrooms, stated that using the handhelds to give the DIBELS® was far more efficient than doing so using pencil and paper, in terms of the following:

- Time it takes to actually administer the assessment. *Everything that is needed is contained within a single unit, so there is virtually no set-up or clean up.*
- Accuracy of the data. *Because teachers administer the assessment without having to worry about managing the timer while also having to keep track of marking responses, they are likely to input the data more accurately.*
- Entry of data into a central system. *In the past, teachers often had to enter the data manually, which proved extremely time consuming. With the handhelds, the data is immediately fed into a central system, where they can be viewed by multiple stakeholders.*
- Presentation of the data. *With graphic, easy-to-read displays, teachers can track individual student growth over time without having to create charts or graphs by hand.*

Feedback Loop

One of the other chief advantages of the Wireless tools noted by teachers is that the handhelds provide immediate turn around from when teachers give the assessment to when they receive the results. Without having to spend any time on data entry and reporting, teachers, literally the data in the palms of their hands, are better able to make decisions about students and instruction immediately after giving the assessment. They do not have to wait six months to receive the data, like is the case with most state mandated standardized tests, which teachers typically administer in the spring and receive results from the next fall. Teachers expressed that to do their jobs well, they need to know where students are not only at the very beginning of the year, but also throughout the entire school year. At one elementary school in New Mexico, teachers arrive at the school site two days before the school year even starts to give the DIBELS® to students, whose parents bring them in for testing. Administrators and teachers then analyze the results together, and group students in cross, grade-level, homogeneous groups according to their overall support recommendation. Organizing leveled reading groups before the school year even starts, teachers can begin literacy instruction on the very first day of school. According to administrators, receiving the results instantaneously also has an impact on teachers' attitudes towards the assessment process and the data. Many expressed feeling that, with the immediate reception of the data provided by the Wireless tools, the assessment data were actually purposed for their use as opposed to being used solely to fulfill accountability requirements. As one RF coordinator in New Mexico said, "Until they [the teachers] got the Palm Pilots, the assessments were always for someone else. With the Palms, they at least get the data for themselves, and it's got them excited about wanting to use the data."

Access to the Data

Teachers and administrators voiced how necessary it is for them to have access to the data if indeed they are expected to use it to guide instruction. As posed earlier, with the handhelds teachers have access to the data immediately after having given the assessment. They can view their individual students' results instantly. For access to different levels of aggregation of the data, including classroom summaries and more detailed student level data, such as how students performed on each subtest, teachers only need to hot sync the data onto a centralized system and login to the password protected mCLASS site. While some indicated having used mCLASS to print reports for parents, teachers said that for the most part, they use their handheld computers to view the data. Administrators and instructional coaches, however, reported

using mCLASS to view student, classroom and grade level data. Several coaches explained that they actually print out results for teachers, and then ask teachers to bring the data to grade level collaboration meetings to analyze them and then discuss, possible intervention strategies, which could be implemented to support the students who need them. District level personnel can also access the data using mCLASS and view higher level aggregations, such as those by school and district on the University of Oregon's DIBELS® site.

According to educators, creating a system so that standardized data, such as that yielded from the DIBELS®, are accessible to stakeholders working on multiple levels of the educational system makes it so that there are no secrets. A child's progress or lack thereof cannot be hidden away, and thus, cannot be ignored. This kind of access also supports educators in working as a team to raise the achievement of particular students, most notably that of those who are struggling. Teachers are no longer left alone to diagnose and solve the problems of the children, who are assigned to their classrooms. Administrators, coaches, parents, and in some cases, students can come together and use the data as focal points, from which they can begin having discussions about ways to better support every student. For many educators, this kind of "team effort" represents somewhat of a paradigm shift; it is no longer solely the classroom teachers' responsibility to attend to the needs of every child, but many peoples' responsibility.

Comprehensibility and Specificity of the Data

The DIBELS® data as presented on the handhelds, as well as on the mCLASS platform are, according to nearly all teachers, easily understandable, and aligned to and specific to instructional goals. Because the data are represented in both chart and graph form, teachers have no problem interpreting them. In fact, for the most part, the data are already interpreted for them. Minutes after giving the assessment, teachers can look to their handheld computers to see whether the student has "no risk," "some risk," or is"at-risk" of reading failure on the particular subtest, which they just completed. If a teacher is continually progress monitoring a child, she, using her handheld computer, can click on a graph, which shows the benchmarks, an aim line – denoting how the child should be progressing between the two benchmarks, and where the child is actually performing in terms of that aim line. At one school in New Mexico, if a student's scores fall below the aim line three times in a row, a group made up of an administrator, the reading coach, the reading specialist and the teachers come together to devise strategies

about how to better support that student. In addition, using the mCLASS platform, teacher and administrators can see exactly what the student's risk level is in terms of each subtest. In some cases, students are performing on Benchmark on some subtests and not on others. Knowing where they are strong and where they are struggling assists teachers in targeting their instruction so they can support those students who need help.

According to participants, the DIBELS® data are also specific and can be connected relatively easily to literacy instruction. By being able to see how students scored on each of the subtests, teachers know where to focus their teaching. For example, one of the key indicators of reading success or failure for Kindergartners is Initial Sound Fluency (ISF). If a student's results show that he is at-risk in terms of ISF, then the teacher not only needs to teach that child the initial sounds, but must also focus on teaching phonemic awareness. The DIBELS® subtests are connected to the 5 Big Ideas of early literacy instruction as outlined by the National Reading Panel (2002). Teachers therefore can analyze the data to determine a child's particular needs and then connect them to instruction accordingly. In addition, by having data that are specific, district and state level leaders can create concrete, actionable goals. For instance, while the ultimate goal is for all children to be grade level proficient in reading by the third grade, the New Mexico Public Education Department has communicated the goal to all NMRF districts to move 75 percent of the children who are labeled Intensive to Strategic, and 75 percent of those children labeled Strategic to Benchmark. These are lofty goals, but certainly provide all the stakeholders with a destination.

CHALLENGES

As with the large-scale implementation of any new tool, several challenges arose, the majority of which relate to the context of schools, and the role that assessment and data can incur on the lives of teachers and students; the others relate to the implementation of the technology. These challenges include: lack of time to analyze the data, over-testing young students, the absence of professional development around educators' use of data to make decisions, and finally, technological glitches and the costs of purchasing the tools.

Lack of Time to Analyze the Data

Even though the majority of teachers agreed that administering the DIBELS® using the handheld computers ultimately saved them time, most concurred that they simply do not have enough time in the school day to analyze the data and make the appropriate links to instruction. An instructional coach working in an elementary school in Albuquerque expressed concern about teachers' lack of time to look at data when she asked, "When do teachers have time to sit down and analyze the data, and ask questions, such as, 'How does this reflect on my teaching?'" At several schools, administrators either designated, or spoke about wanting to designate time during the school day for teachers to collaborate in weekly grade-level planning meetings, during which they analyze data so as to identify patterns and trends and plan instruction accordingly.

Over-testing students

With the rise in testing requirements that accompanied the implementation of NCLB in addition to the assessment practices already in place before it began in 2001, teachers reported feeling overwhelmed by the sheer amount of standardized testing, which they are expected to do. "It's incredible the amount of testing. I don't mind doing the testing. It gives me a lot of valuable information, but I hate being away from my kids," commented a teacher in Albuquerque. At most of the schools in New Mexico, teachers are given a couple of days when substitutes cover their classes, so they can administer the DIBELS® and possibly, a diagnostic like the TPRI® to their students. Kindergarten teachers, in particular, worried whether administering so many standardized assessments - the DIBELS® and the diagnostic are given in addition to the assessments that they already had in place – is developmentally inappropriate. Many also questioned the number of hours spent testing students, as well as the enormous amount of time now dedicated to preparing students to take tests. At the same time, many felt it was good practice to constantly and consistently monitor students. Still, they said that testing does not take the place of teaching and that they need time to dedicate to actual instruction.

Lack of Professional Development on Using Data to Inform Instruction

Even though teachers readily embraced the handheld technology after just one day of training, when they began to use the handhelds on their own to assess students, they discovered the need for professional development on how to use data to inform instruction. In addition, as teachers began to use the

handhelds on their own to assess students, many began to discover areas in which they needed more guidance and additional resources. They expressed the need for good models of teaching literacy that incorporate the use of data and strategies for differentiating instruction. For the majority of teachers, whom we interviewed, this was their first experience with an instructional program that required using assessment data to inform classroom practice. The challenge for districts and schools is locating and/or designing quality professional development, which addresses these topics and meets teachers' individual needs.

Technology Glitches

Schools with fewer resources, on which to draw, struggled more than schools with resources and a solid infrastructure that could provide the necessary technical support to sustain the use of the handhelds. Nonetheless, the majority of the NMRF schools were able to implement the devices by the second benchmark period of the first year of implementation. Technology glitches did occur at several schools throughout the year, however. At one school, the staff was unable to upload their data because a local server was down, and they did not have the resources or staff to repair it. In many other cases, schools had to rely on only a few Internet-connected computers, where all teachers could sync the data, slowing the process of retrieving data. In a few instances, teachers lost assessment data because their handheld computers were not adequately charged, or because they did not upload the data regularly with a desktop computer, and so consequently, the data were not backed-up nor stored on the system's main website. While Wireless Generation™ provided technical assistance over the phone, having resources within a district proved extremely valuable when having to solve technical problems quickly.

High Cost

Though rarely noted by teachers, administrators and district staff frequently cited the high cost of the Wireless tools as an obstacle to being able to sustain their implementation. They expressed concern about being able to identify sources of funding to purchase them after the targeted federal funds provided by NMRF grant are gone. The cost of maintaining and replacing broken equipment for any technology innovation is expensive, as is maintenance of the technological infrastructure necessary to support these kinds of tools. The real challenge, however, lies in paying the cost of the licensure fee for each participating student year after year. Many working on the state, district and even the school building level noted that they find the fee to be "very high" and "costly." Still, several administrators working on the school building

level said that they want to figure out a way to pay the licensure fees after the grant money is gone because they find the Wireless tools to be that valuable to teachers' instructional practice. Others were less sure about the continued use of the tools, not seeing how they could possibly afford to pay the licensure fees without the assistance of RF monies. Generally, small and rural districts in New Mexico, which lack the infrastructure existing in larger districts, are more challenged to pay for and support the use of the handheld computers and the mCLASS platform.

NEW QUESTIONS AND FUTURE RESEARCH

While the number of schools and districts that are choosing to use handheld computers to support data-driven decision-making increase, so do the questions and opportunities for additional research. From the research conducted thus far, we have identified several issues that call for further exploration. For example, one of the issues that continually arose when talking with administrators responsible for coordinating school and district assessments centers on implementation models, and in particular, on who should administer the DIBELS® – the classroom teacher or the school-based literacy coach? More specifically, the question remains of whether it is more valuable for the teacher to be in the classroom teaching while the school's literacy coach assesses her kids, or for the classroom teacher to be administering the assessment herself so that while doing so she can collect additional anecdotal evidence about the student's abilities? We also wondered whether classroom teachers were more apt to view, probe and make decisions about their instruction based on the data if they gave the assessment themselves.

We also have speculated about the role that the Wireless tools play in regard to parent and student involvement. For example, the majority of teachers found the DIBELS® data and reports compelling enough to share with parents at parent-teacher conferences. Based on many teachers' comments about their use of the handheld technology, we hypothesized that teachers found this information more relevant to their conversations with parents than other assessment data because:

- Teachers found the data to be relevant enough to their instructional practice to show it to parents when discussing their child's progress.
- Teachers believed the data accurately represented a student's academic performance.
- Teachers found the graphic representation of assessment data easy-to-read and comprehensible to parents.

- Teachers were able to print out graphs that represented individual student progress over time

Teachers also found themselves sharing the data readily with their students because:

- Teachers discovered that when students viewed their own progress, they were motivated to improve (students, particularly liked and understood the graphic representation of their progress: the "running man").
- Teachers observed that students liked and were interested in the handheld technology.

As researchers begin the third year of the NMRF evaluation and continue to collect data in Chicago and Mamaroneck for the NSF Evaluation Framework Project, we will keep on examining the issues related to the role that handheld technology and mCLASS platform play in supporting assessment and the use of data to inform classroom teaching. With these questions in mind, we will explore the links between assessment, data and instruction, and the ways by which teachers can use assessment data to increase communication with students and their families. Further investigation into the potential of technology to support teachers in a wide range of activities will not only lead to new and different issues and questions, but also help in gaining a better understanding of technology's capacity to support teachers' in their primary activity: teaching. With the rising pressure across all levels of the education community to respond to calls for regular assessment and strategic use of data, it is essential that we investigate the possibilities that technology-based solutions, such as the handheld computers, possess to aid educators in their work.

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