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An Analysis of Technology-Assisted Progress Monitoring to Drive Improved Student Outcomes

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Summary

This paper examines the effects that progress monitoring has on student achievement and teacher practice by reporting on the findings of two studies. The first study presents a quantitative analysis of a large data set to determine whether progress monitoring affects student outcomes, as measured by the Dynamic Indicators of Basic Early Literacy Skills (DIBELS®). The data used in this study was drawn from Wireless Generation's database of DIBELS assessment results collected by teachers using mCLASS®:DIBELS® handheld-based assessment software. Results revealed large positive effect sizes from weekly progress monitoring and gains from students at all risk levels. Specifically:

- The average number of progress monitoring administrations per period under the "infrequent PM" conditions was 3. Small-to moderate effect sizes were observed in all of these conditions, with the strongest effect sizes (ranging from 0.26 to 0.71) observed in kindergarten.
- The average number of progress monitoring administrations per period under the "frequent PM" conditions was 11. Moderate to large effect sizes were observed in almost all of these conditions, with the strongest effects being observed in kindergarten and first grade (ranging from 0.40 to 1.25).
- In all cases, the "frequent PM" conditions had a greater effect size than the corresponding "infrequent PM" conditions.
- Comparable effect sizes were observed between the corresponding intensive, strategic, and benchmark conditions.

These results reinforce, on a large scale, the existing research that shows progress monitoring has an impact on students' academic growth. More specifically, they imply that students who receive frequent progress monitoring are experiencing greater reading gains than those students who receive infrequent or no progress monitoring.

The second study offers an in-depth qualitative look at how progress monitoring influences teacher practice, based on interviews and observations of teachers engaged in a statewide literacy initiative that uses the mCLASS:DIBELS assessment and reporting platform. Analyses of interviews and observations in a range of settings where progress monitoring occurs provide perspective on what is happening during the progress monitoring activity for both teachers and students. The research reveals that progress monitoring supports teachers and students in several key interactions:

- Progress monitoring provides an opportunity for a teacher and a student to sit quietly and read a connected text, with the teacher paying close attention to the students' reading habits.
- Progress monitoring encourages students to participate in the assessment process by allowing them to view the outcome of the assessment immediately, as well as note progress or lack of progress.
- Progress monitoring allows a teacher to have access to clear grade-appropriate goals for students.

Overview

In recent years much attention has focused on the essential role that early reading instruction plays in later academic success. A wide range of studies reveal that students who are poor readers at the end of first grade rarely catch up to their grade-level peers (Francis, et al., 1996; Lyon, et al., 2001; National Reading Panel, 2000; Shaywitz, et al., 1999; Torgesen & Burgess, 1998). Research also shows that if those struggling readers are identified within the first few years of schooling and provided with targeted and intensive instruction, they are more likely to make the progress necessary to catch up with their peers who are reading at grade level (American Federation of Teachers, 2004). The need for early and ongoing assessments of students' reading skills is therefore vital.

Only recently has the education community really begun to consider the role that assessment plays in the process, to explore what teachers need to make use of assessment information, and to identify which types of assessments are most effective at supporting the development of students' reading skills. Progress monitoring is a form of ongoing assessment by which teachers can regularly and systematically monitor students' academic performance. Its purpose is to determine how well students, particularly those at risk of reading failure, are progressing towards meeting an identified goal. The impact of progress monitoring on student reading achievement has the potential to be great, and yet, questions about whether progress monitoring makes a difference in teaching and learning persist. In this paper, we discuss the effect that progress monitoring has on student achievement and teacher practice by reporting the findings of two studies. One study offers an in-depth look at how progress monitoring influences teacher practice based on qualitative data, including interviews and observations of teachers engaged in a state-wide literacy initiative, while the other focuses on the analysis of a large data set to determine if progress monitoring affects student outcomes as measured by DIBELS. Qualitative findings provide contextual information about the administration of progress monitoring in classroom settings, and discuss teacher and student experiences as part of the progress monitoring process. Quantitative findings indicate levels of impact for different frequencies of progress monitoring.

In both studies, teachers conducted progress monitoring using the DIBELS early literacy assessment on kindergarten through third grade students. As a main component of DIBELS, progress monitoring allows educators to check the progress of an individual student, determine if the child is making adequate progress towards attaining grade level proficiency, and ensure that those students who are receiving intervention are progressing on target (Good, Gruba, & Kaminski, 2001). In both cases, teachers administered DIBELS progress monitoring to students one-on-one, using handheld computer software developed by Wireless Generation, located in New York City. Teachers conducted progress monitoring in a variety of ways and at varying frequencies; nonetheless, both studies reveal that progress monitoring does appear to have a positive effect on student achievement and teacher practice.

Previous studies that examine the role of handheld computers in supporting teachers' use of assessment data to inform instructional decisions (Brunner & Honey, 2001; Heinze & Hupert, 2005; Hupert & Heinze, 2006; Penuel & Yarnall, 2005; Perry, 2003; Sharp, 2004; Sharp & Risko, 2003) suggest that teachers' use of handheld computers to support the collection of reading assessment data yields several positive effects. These effects align with key elements identified in recent research as necessary for teachers to be able to use student-level data to shift their own practice and meet student needs. According to research, for assessment data to be useful to teachers it must be: (a) specific enough to show where students need help; (b) accessible in a timely manner so that teachers can act upon the information; and (c) comprehensible so that it can be translated into practice (Popham, 1999; Schmoker, 2000). While simple, clear, colorful graphics help (Herman & Gribbons, 2001), presenting data in a way that is meaningful to teachers remains difficult (Ackley, 2001). Commercially published assessment data has traditionally arrived months, or even an entire school year, after teachers administered the test, and is delivered in a format which is static and not necessarily designed to meet the particular needs of teachers.

Yet as expectations for reading instruction and tailoring of instruction to student needs increases, so has the expectation that teachers will regularly collect and make use of assessment data to inform their classroom instruction (Thorn, 2002). When asked about the experience of using handheld computers to collect assessment data, educators have responded that the use of handheld computers has had a positive impact on how they think about and make use of assessment data, and has the potential to alter what they do in their classrooms as they implement reading instruction on a daily basis. Findings from a multi-school study on teachers' use of handheld computers to collect assessment data also indicate that the tools:

- increase efficiency when administering an assessment;
- increase accuracy of the timed components of an assessment;
- decrease administrative tasks because the need for data entry is eliminated;
- improve access to data because assessment information is available immediately upon completion of an assessment; and
- improve the relevance of the data, as they reflect the most current state of student understanding and classroom teaching, and therefore could be sensitive enough to show changes in student understanding and classroom teaching (Heinze & Hupert, 2005; Hupert & Heinze, 2006).

These findings suggest that use of technology to support assessment activities may increase the likelihood that collected assessment data will become useful by providing teachers with immediate and relevant information about student progress. Yet many aspects of assessment – the data collection process, the analysis and representation of findings, the instructional decisions made

based on these analyses – are undertaken without guidance from the research community. This paper attempts to offer some guidance by addressing one aspect of this assessment process: progress monitoring. Below we examine progress monitoring and benchmark assessment data from a national sample of classrooms. Teachers in these classrooms are able to draw on the range of benefits offered by handheld computers, and in this way have access to the key elements that researchers have deemed necessary to make effective use of assessment data. Under these optimal circumstances, we hope to answer the following questions:

- Does progress monitoring have a positive impact on student reading?
- Does the frequency of progress monitoring have an effect on student reading?
- What effects does progress monitoring have on teacher practice?

We attempt to answer these questions by drawing on interviews and observations with classroom teachers as well as on analyses of the large set of progress monitoring data collected over the course of the 2004-2005 school year. We will discuss these findings further within the context of the classroom, where teachers are grappling with questions about how to make assessment data useful.

The DIBELS Assessment on a Handheld Computer

The DIBELS assessment is an early literacy screening developed by Dr. Roland Good and a team of researchers at the University of Oregon (Good & Kaminski, 2002) to assess students' early literacy skills and identify those who are not on track for grade level reading. DIBELS targets a set of predictive literacy skills that research has shown are necessary for children to acquire if they are to become fluent and purposeful readers (Good, et al., 2002; Good, et al., 2002; Hintze, et al., 2003). The assessment is made up of a series of timed tasks and subtests that vary depending on the students' grade and the time of year administered. The subtests include: Initial Sound Fluency (ISF), Letter Naming Fluency (LNF), Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), and Word Use Fluency (WUF). The assessment is administered, during three benchmark periods throughout the school year: fall, winter, and spring.

During the 2004-2005 school year an estimated 7,865 schools within 2,447 districts in 49 states and Canada used DIBELS to assess over 1.7 million students in kindergarten through third grade. While originally designed to be administered on paper, DIBELS is now among several reading assessments that have been developed for use on handheld computers. In 2003, Wireless Generation collaborated with DIBELS authors to develop a handheld version of the assessment: mCLASS:DIBELS. A teacher who is working in a school that uses handheld computers to collect student assessment

data is able to view the roster of students, as it is input into the system prior to administering the assessment. When the instructor prepares to assess a student, the system indicates which assessment subtests are appropriate for that student based on grade level, time of year, and for progress monitoring, which passages have already been administered. Teachers provide students with print copies of the assessment and are able to follow the students' reading, word-by-word, on the handheld screen (see Figure 1). Teachers use the handheld stylus to tap on the any words read incorrectly, as well as to indicate any words missed.

Figure 1. Screen Shots on the Handhelds: A Sample Class List, and a DIBELS® Review

The DIBELS assessment indicates students' risk for reading failure based on one or more subtests, depending on the students' grade level. There are three risk categories: Benchmark, or low risk because the student has met the benchmark for that grade; Strategic, because the student requires strategic support to attain grade level skill; and Intensive, because the student requires intensive support to attain grade level skill. Typically, students at the Intensive level of risk have a 20% or less likelihood of reaching later reading goals without targeted intervention.

Once teachers administer an assessment or progress monitoring using mCLASS:DIBELS, they immediately receive information about a student's risk category (see Figure 2).

Figure 2. A Student's Phonemic Segmentation Fluency (PSF) Results

Teachers then can navigate to a screen that displays a graph, which reveals an individual student's progress or lack thereof in relation to existing benchmarks. Teachers complete the data collection process when they upload 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 administered each progress monitoring or 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 sync their data. Once the teacher uploads the data, anyone who has access to the password-protected Web site can manipulate the data so they can view student, classroom, grade, or school level reports (see Figure 3).

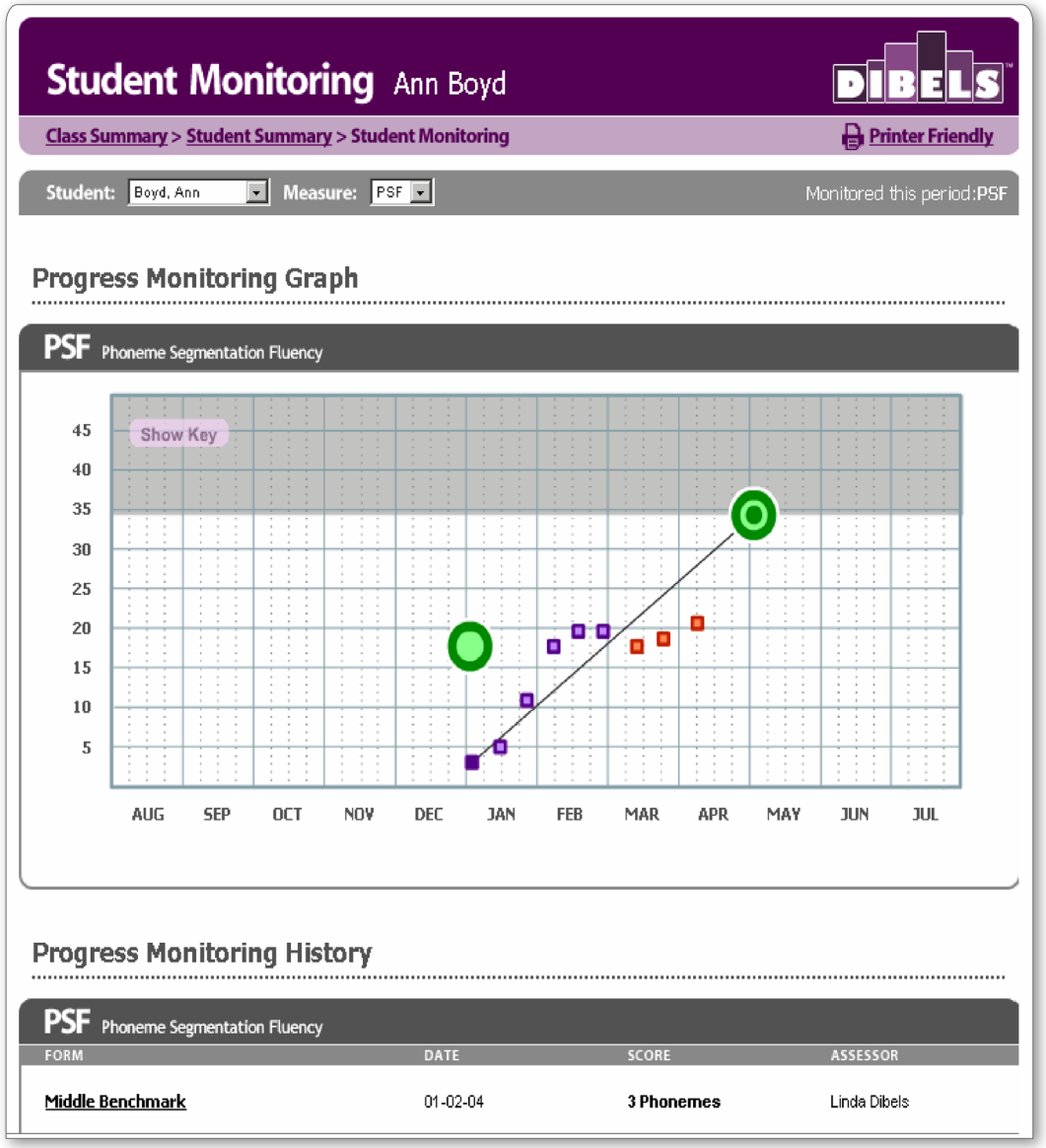

Figure 3. Presentation of the Phoneme Segmentation Fluency, a Sub-test of DIBELS®, Results for a Sample Student

Note: The green circles represent benchmarks.

What Administering Progress Monitoring Looks Like in a Classroom

DIBELS Progress Monitoring consists of a short text that is leveled according to grade and time of year (beginning or end of year). A student reads the passage provided by the teacher while being timed for one minute. The number of words read correctly are recorded during that time. Good and Kaminski (2003) recommend goals, represented as the number of words read per minute, necessary for students to read to be considered on track to eventually read at grade level. For example, students in the spring of third grade must meet the minimal goal of reading 110 words per minute to be considered on track for reading at grade level, and will be considered in need of intensive support if they read below 70 words per minute on a specified grade-level text. Teachers note that one of the benefits of DIBELS over other reading screenings is that it offers many leveled reading passages for each grade so that students can be progress monitored frequently without having to reread passages previously used in other progress monitoring sessions.

When using a handheld computer and mCLASS:DIBELS software to collect progress monitoring data, a teacher will often set up a station or area where students sit for a few minutes to complete the assessment task. The area is often located in a corner of a classroom, in a somewhat protected area, or is set up in a different room or location such as a quiet corner in a hallway, or a reading room. In most cases a teacher will progress monitor students one-on-one, while other students work independently at centers, or with a classroom aid. She will pull individual students out to administer progress monitoring over several days. In some cases a school interventionist or reading coach will administer progress monitoring while the teacher stays with the rest of the class.

During the assessment, the teacher presents the student with a DIBELS progress monitoring booklet opened to a particular passage selected by the teacher (based on the time of year, the student's grade level, and passages that that student previously read). The handheld computer screen, using mCLASS:DIBELS software, displays the text to be read by the student. The teacher taps the screen to indicate that the student has begun to read, and the assessment software freezes the screen at the end of one minute to indicate that time has expired. During that time, the teacher taps each of the words the student reads incorrectly. Once the minute has passed the teacher will be prompted to place a marker on the handheld screen at the point in the text where the student stopped reading at the end of one minute. Then the handheld screen will display a graphic indicating the number of words the student read in one minute, which is represented by an image of a running figure that stands on a continuum which starts as the color red, changes to yellow, and ends as green. In nearly all instances of progress monitoring students immediately ask to see "where they are" on the screen after completing the progress monitoring. Teachers show students the mCLASS screen with the running figure and students see both what color they are ("I'm red") and what number they are ("I got 28 this time").

Once the administration is complete, teachers upload the new assessment data at a syncing station so that they can then view a student's progress over time by looking at an mCLASS® graph that plots a student's starting point (the number of words they read in one minute at the beginning of the year) and can see the desired end point, or plot line, indicating the ideal progress for a particular student at a particular grade level. All progress monitoring results are then plotted in relation to this aim line and a teacher can easily see if a student is making progress (following, or catching up to the expected aim line) or struggling (falling below, or failing to catch up to the aim line).

Collection of Interview and Observation Data from a Reading First Evaluation

Over the course of two years, from 2003 to 2005, researchers conducted interviews with teachers, reading coaches, principals, and district level administrators about the implementation of the DIBELS assessment and progress monitoring, as well as the use of the Wireless Generation mCLASS system using handheld computers to support the collection and analysis of student reading assessment data. An analysis of this data reveals a range of interesting findings with regard to how teachers view assessment data, how and when they choose to make use of such data, and how they integrate the acts of collecting, viewing, and using the data in their classroom activities on a daily basis. Below, we provide information based on data collected from interviews and observations conducted in a total of 17 districts and 34 schools. Researchers conducted 39 classroom observations in kindergarten through third grade classrooms during the designated reading block, as well as interviews with 25 classroom teachers and 56 educators in other positions including principals, reading coaches, superintendents, and district level program coordinators. The data gathered from site visits to these schools provide contextual information which can serve to inform our understanding of how progress monitoring is used by teachers to support their decisions about classroom instruction, especially as they pertain to individual student's progress.

In interviews, teachers regularly report that they find the act of collecting data and then receiving immediate feedback valuable. Many noted that the fast turnaround of information prevents data from being "dead on arrival" and improves its relevance for classroom decision making. Another point of interest is that progress monitoring appeared to increase student involvement in their own academic progress. At some schools, students regularly plot their own progress on graphs or charts, which are then posted in reading rooms or classrooms. Teachers and administrators also noted the benefits of using the data to increase parent involvement. By using the DIBELS assessment data to introduce information about student progress to parents during parent-teacher conferences, and in schools where students are making strong gains in reading, teachers and administrators were better able to keep parents abreast of their children's progress, as well as share strategies that parents can

use with their children at home. Teachers indicated that interest in using student assessment data to engage parents has gained in popularity as educators exchange ideas across districts. In some cases, students even lead discussions with their parents about their own progress during their parent-teacher conferences. Teachers report using assessment and progress monitoring data as a way to introduce their reading goals and expected progress over the course of the year.

The emerging role that students are taking in the use of assessment and progress monitoring data comes as somewhat of a surprise, particularly because it appears to be a result of the ongoing progress monitoring taking place in so many locations. When progress monitoring was first introduced, interview data suggested skepticism among educators that an increase in time spent on assessments would precipitate a corresponding decrease in time spent on instruction. Previous experiences with assessments lead some teachers to question the appropriateness of assessments for such young children, as well as the over-testing of at-risk students. These concerns, however, quickly dissipated within our sample. We speculate this was the result of the assessment's ease of administration (one minute per student) and the data's relevance (the instant turn-around from assessment to data-point along an individual aim line). Teachers may also be picking up on students' interest in their own progress as represented by their desire to view their progress on the handheld computer. These findings have led to more questions about the collection of assessment data as it relates to student outcomes, in particular about the role that progress monitoring plays in supporting student reading success and engagement in monitoring their reading growth.

Progress Monitoring Data Set

During the fall of 2004, approximately 10,000 teachers working in 31 states used Wireless Generation's mCLASS:DIBELS with handheld computers to collect and analyze data for approximately 200,000 students in pre-K through sixth grade. The data collected on these 200,000 students constitute our sample for this study. The data presented here have been collected by teachers, reading coaches, or others working at the classroom level in schools that have chosen to (a) adopt the use of the DIBELS assessment for early literacy, and (b) collect DIBELS assessment data using handheld computers. While the circumstances for data collection vary from school to school, district to district, and state to state, there are many commonalities among all these locations:

- All teachers, or others responsible for the collection of the DIBELS assessment data using mCLASS, participated in professional development events focused on the administration of the DIBELS assessment, and aimed to support it using a handheld computer.

- All teachers, or others responsible for collecting the DIBELS data, have access to Wireless Generation's mCLASS:DIBELS Web site where assessment data can be seen and stored. This information is available in multiple visually-enhanced formats that make use of graphics and color coding to highlight students at varying levels according to the DIBELS assessment.

- All teachers were exposed to the basic DIBELS recommendations about how often teachers should conduct progress monitoring. These guidelines suggest that students who are identified as performing at Benchmark (on grade level) should be progress monitored once every couple of months; students who are performing at the Strategic level (requiring strategic support so that they can attain grade level proficiency) should be progress monitored approximately once every four weeks; and students who are performing at the Intensive level (needing intensive support to attain grade level proficiency) should be progress monitored every two weeks. It should be noted that individual schools, districts and states have requirements that may differ from these ranging from no requirement at all for progress monitoring to weekly progress monitoring for the most at-risk students.

Analysis of Progress Monitoring Data

To assess the impact of progress monitoring, we conducted multiple analyses using our sample of 200,000 students. The sample includes data on students for whom teachers conducted three benchmark assessments during the course of a single year. Students also received either no progress monitoring, minimal, or frequent progress monitoring. This data sample represents an extremely diverse array of district types, sizes, demographics, and instructional practices. However, it should be noted that this sample is somewhat self-selected in that a decision was made on either the school, district, or state level to purchase the DIBELS assessment system using Wireless Generation's mCLASS software to facilitate the administration of DIBELS. Students' results from classrooms where teachers used paper and pencil to administer progress monitoring were not included in this analysis. To discover the impact that progress monitoring has on student reading outcomes as measured by the DIBELS, the data set was sorted into conditions according to the following variables:

1. student grade level: K, 1, 2, or 3;

2. time period of interest: beginning-to-middle of year or middle-to-end of year;

3. the number of progress monitoring assessments administered during the period: none ("no PM"); 1-6 ("infrequent PM" would allow for approximately one progress monitoring every four weeks during a single semester); or 7 or more ("frequent PM" would allow for approximately one progress monitoring every two weeks during a single semester); and
4. the student's instructional support recommendation at the beginning of the period, as determined by the full DIBELS Benchmark assessment: Intensive (high risk); Strategic (some risk); or Benchmark (low risk).

Most of the analyzed conditions included an *n* factor of several thousand students or more.

The DIBELS measure used to assess gains in each grade and time period of interest was determined by the progress monitoring guidelines published by the assessment's authors. For each student, a gain score was calculated by taking the difference between the student's raw scores on that measure at the beginning and end of the period. An effect size was calculated for each of the "infrequent PM" and "frequent PM" conditions by comparing its mean gain and standard deviation of gain to the mean gain and standard deviation of the corresponding "no PM" condition. To ascertain if any meaningful differences exist between the results of students who receive varying amounts of progress monitoring, students' mean scores were compared with the standard deviations to determine the effect sizes. Table 1 (next page) shows the sample and effect sizes for each of the analyzed conditions.

Table 1: Analysis Results

				NO PM (PM_COUNT = 0)			INFREQUENT PM (0 < PM_COUNT < 7)				FREQUENT PM (PM_COUNT >= 7)			
Grade	**Period of Year**	**Assessment Measure**	**Starting Support Rec**	**N**	**Mean Gain**	**Standard Deviation**	**N**	**Mean Gain**	**Standard Deviation**	**Effect SIze**	**N**	**Mean Gain**	**Standard Deviation**	**Effect SIze**
K	Beginning to Middle	Initial Sound Fluency	Intensive	6850	9 .5	**1 0.9**	6807	1 3.7	1 1.4	0 .38	1277	1 7.0	1 1.8	**0 .66**
K	Beginning to Middle	Initial Sound Fluency	Strategic	11902	1 1.1	**1 3.7**	11931	1 5.4	1 2.9	0 .33	1193	1 9.8	1 3.7	**0 .64**
K	Beginning to Middle	Initial Sound Fluency	Benchmark	16951	1 1.5	**1 4.2**	6253	1 5.2	1 3.8	0 .26	377	2 0.5	1 3.7	**0 .64**
K	Middle to End	Phoneme Segmentation Fluency	Intensive	5855	7 .9	**1 1.7**	4581	1 6.7	1 6.4	0 .62	2567	2 7.1	1 8.4	**1 .25**
K	Middle to End	Phoneme Segmentation Fluency	Strategic	10818	1 5.0	**1 4.8**	11259	2 5.9	1 5.9	0 .71	4158	3 3.6	1 5.8	**1 .21**
K	Middle to End	Phoneme Segmentation Fluency	Benchmark	19186	1 5.4	**1 3.0**	11350	2 2.3	1 3.3	0 .52	2659	2 7.7	1 3.7	**0 .92**
1	Beginning to Middle	Nonsense Word Fluency	Intensive	7020	1 7.5	**1 6.6**	4678	2 4.5	1 5.8	0 .43	1644	2 9.6	1 5.7	**0 .75**
1	Beginning to Middle	Nonsense Word Fluency	Strategic	7526	2 2.5	**1 7.0**	6847	2 7.8	1 5.7	0 .33	1665	3 3.9	1 7.2	**0 .67**
1	Beginning to Middle	Nonsense Word Fluency	Benchmark	26510	1 7.4	**1 9.7**	10046	2 4.4	1 9.8	0 .35	1745	3 2.3	1 9.7	**0 .75**
1	Middle to End	Oral Reading Fluency	Intensive	7968	9 .2	**1 0.1**	4774	1 0.4	9 .4	0 .12	4434	1 3.3	1 0.3	**0 .40**
1	Middle to End	Oral Reading Fluency	Strategic	6632	1 6.1	**1 3.9**	7246	1 8.1	1 3.2	0 .14	6335	2 2.0	1 3.9	**0 .42**
1	Middle to End	Oral Reading Fluency	Benchmark	22072	2 0.6	**1 6.4**	10435	2 4.4	1 6.4	0 .23	3956	3 0.0	1 7.1	**0 .56**
2	Beginning to Middle	Oral Reading Fluency	Intensive	8484	1 3.1	**1 3.0**	5410	1 4.8	1 2.9	0 .13	3058	1 9.1	1 3.0	**0 .46**
2	Beginning to Middle	Oral Reading Fluency	Strategic	7731	2 3.5	**1 4.3**	7430	2 6.6	1 4.2 0	0 .21	2617	3 1.4	1 4.0	**0 .55**
2	Beginning to Middle	Oral Reading Fluency	Benchmark	21348	2 4.8	**1 6.9**	8107	2 8.2	1 6.9	0 .21	1022	3 6.4	1 7.3	**0 .68**
2	Middle to End	Oral Reading Fluency	Intensive	8414	1 1.3	**1 3.0**	8258	1 4.7	1 3.8	0 .25	6034	1 8.0	1 4.0	**0 .50**
2	Middle to End	Oral Reading Fluency	Strategic	4166	1 3.1	**1 4.0**	5142	1 6.5	1 4.1	0 .24	2817	2 0.8	1 4.4	**0 .55**
2	Middle to End	Oral Reading Fluency	Benchmark	22252	1 0.8	**1 6.7**	11424	1 4.7	1 7.0	0 .23	2801	1 7.8	1 6.9	**0 .42**
3	Beginning to Middle	Oral Reading Fluency	Intensive	10257	1 0.2	**1 2.8**	6778	1 1.8	1 3.0	0 .13	3452	1 5.8	1 2.8	**0 .44**
3	Beginning to Middle	Oral Reading Fluency	Strategic	10257	1 1.2	**1 4.2**	7511	1 3.5	1 4.9	0 .16	2325	1 7.8	1 4.4	**0 .46**
3	Beginning to Middle	Oral Reading Fluency	Benchmark	17757	1 2.0	**1 7.7**	6559	1 4.9	1 7.3	0 .16	971	2 0.5	1 7.6	**0 .48**
3	Middle to End	Oral Reading Fluency	Intensive	9121	1 7.0	**1 6.2**	9143	2 0.3	1 7.3	0 .20	6126	2 2.4	1 6.7	**0 .33**
3	Middle to End	Oral Reading Fluency	Strategic	6698	1 8.9	**1 4.6**	8158	2 1.9	1 5.2	0 .20	4009	2 5.2	1 4.9	**0 .43**
3	Middle to End	Oral Reading Fluency	Benchmark	15782	1 1.4	**1 6.7**	8207	1 4.1	1 6.6	0 .16	2079	1 7.6	1 6.3	**0 .38**

Findings

The results of these analyses indicate that the frequent progress monitoring has a positive impact on student outcomes. Where fewer progress monitoring administrations took place, smaller effect sizes were observed. Where larger numbers of progress monitoring administrations took place, greater effect sizes were seen (see Figures 4a, 4b, and.4c).

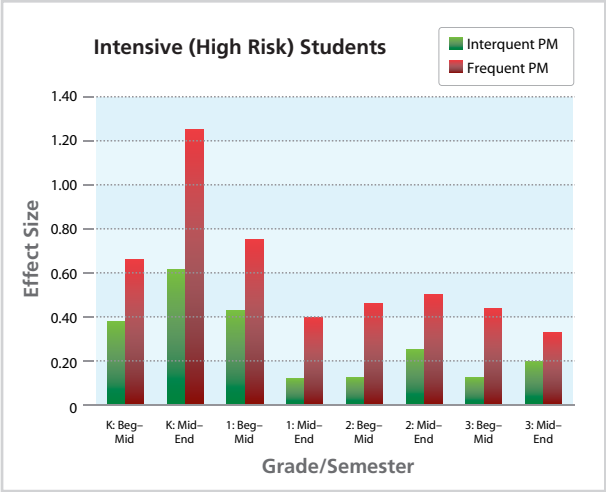

Figure 4a. Effect Size Charts
Note: High positive effect sizes are observed, especially in early grades, with frequent PM having greater effect.

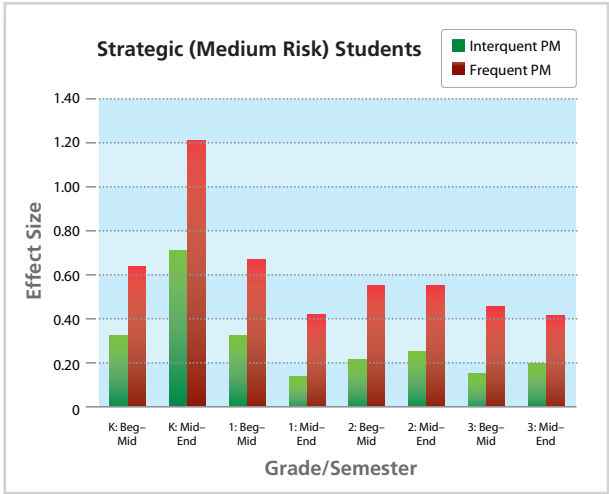

Figure 4b. Effect Size Charts

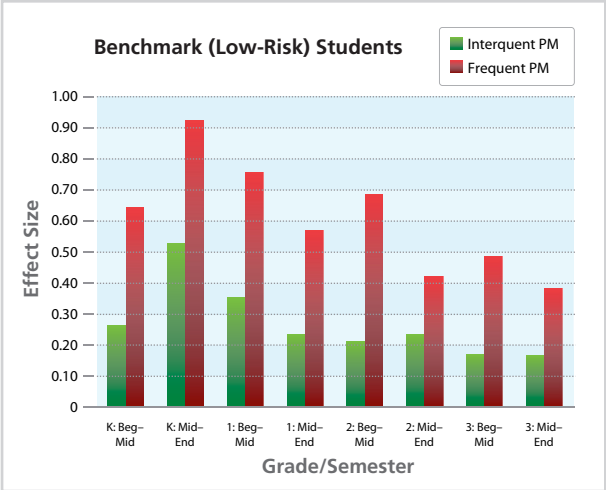

Figure 4a. Effect Size Charts
Note: Even higher-performing students with higher amounts of PM show greater gains.

- The average number of progress monitoring administrations per period in the "infrequent PM" conditions was 3 (a monthly progress monitoring protocol would fall into these conditions). Small to moderate effect sizes were observed in all of these conditions, with the strongest effect sizes observed in kindergarten (ranging from 0.26 to 0.71).
- The average number of progress monitoring administrations per period in the "frequent PM" conditions was 11 (a weekly progress monitoring protocol would fall into these conditions). Moderate to large effect sizes were observed in almost all of these conditions, with the strongest effects being observed in kindergarten and first grade (ranging from 0.40 to 1.25) and declining in the higher grades.
- In all cases, the "frequent PM" condition had a greater effect size than the corresponding "infrequent PM" condition. This suggests that bringing the frequency of progress monitoring up to the levels suggested by the DIBELS authors—every 1 to 2 weeks for struggling readers—may yield a greater benefit to students than a less frequent approach.
- Comparable effect sizes were observed between the corresponding intensive, strategic, and benchmark conditions. This important finding suggests that all students may benefit from some level of progress monitoring, even if they are showing good reading performance.

The differences in mean gains between the "infrequent PM" and the "no PM" conditions, and between the "frequent PM" and the "no PM" conditions, were significant at the $p < .001$ level. These results reinforce, on a large scale, the existing research that progress monitoring has an impact on students' academic growth. More specifically, they imply that students who receive frequent progress monitoring are experiencing greater reading gains than those students who receive infrequent or no progress monitoring. It therefore appears that a positive relationship exists between more frequent progress monitoring and reading gains.

As educators and researchers we recognize that the administration of an assessment, in isolation, is unlikely to change student reading outcomes. We can speculate that between the administration of the assessment and the student's change in reading outcome, something occurs that precipitates a change in reading. Moreover, we hypothesize based on these findings that whatever the "it" is that takes place between the assessment and the student outcome, increasing the frequency of the assessment makes the "it" more effective. This leads to questioning what takes place during and after progress monitoring. What kinds of interactions do teachers and their students have during this activity? And what do teachers and their students take away from this activity? Analyses of interviews and observations in a range of settings where progress monitoring occurs provide perspective on what is happening during the progress monitoring activity for both teachers and students.

Here we draw on classroom observations as well as the interviews with teachers and administrators about the use of assessment data to inform instruction to further explore the relationship between progress monitoring and positive student reading outcomes. The data suggests that teachers follow the recommendations offered by the DIBELS developers for administering progress monitoring. Students identified at Benchmark on DIBELS are progress monitored two or three times per semester, students identified as needing Strategic support are progress monitored approximately once each month, and students identified as needing Intensive support are progress monitored approximately once every two weeks. Within these recommendations variation exists from school to school, and even from classroom to classroom. Some teachers report feeling that progress monitoring is so valuable and so quick to administer, they regularly progress monitor all students, regardless of their support recommendation. Others feel that progress monitoring is so time-consuming it takes away from instructional time, and hence administer it only to the most struggling readers in the class.

Several salient themes with regard to the benefits of progress monitoring emerged from the data collected. Progress monitoring can provide an opportunity for:

- a teacher and a student to sit quietly and read a connected text, with the teacher paying close attention to the student's reading;
- students to participate in the assessment process by viewing the outcome of the assessment immediately and noting progress or lack of progress; and
- a teacher to have access to clear grade-appropriate goals for students.

Each of these may seem like common events within the course of schooling, yet for many teachers and students the opportunity for these kinds of events is rare.

Time to Read Connected Text

With increased emphasis on the five Big Ideas in Beginning Reading: phonemic awareness, alphabetic principle, vocabulary, accuracy and fluency, and comprehension (National Reading Panel, 2000); and influence from the relatively successful Reading First Initiative, schools and teachers are increasingly focusing their reading instruction on the multiple discrete skills of reading to prepare students to become readers. Yet, observations in multiple classrooms reveal that focusing on these skills alone may squeeze out the reading of connected texts. Students spend significant time reading decodable texts (designed to provide practice in a particular skill, such as reading a short "a" sound), but less time reading real texts. Teachers who have large classes and little, if any, classroom

assistance do not have the chance to sit quietly with an individual student and listen to that student read. We therefore pose the question: could the positive outcomes associated with frequent progress monitoring be a result of increased attention and time spent reading connected text, as well as increased time spent on one-on-one instruction? If so, more frequent progress monitoring would serve to foster both of these positive events. Still, it is difficult to expect that a single minute more spent on reading, even every two weeks, would have much impact on student outcomes. While this might represent a large percentage of the reading done by students needing intensive support, it is likely a very small percentage of the overall reading done by students who are already at benchmark.

Student Participation in Assessment

One of the greatest changes observed in classrooms where teachers introduced progress monitoring was the teachers' and students' attitudes toward the data collected. In most cases, when it comes to assessment data, the teacher administers the assessment, submits the data to another entity (the state, the district), and then receives the results some time later. Usually, the results arrive after a student has left, or long after a particular skill or task was introduced. These data therefore are rendered useless and only serve accountability purposes. They are not designed to inform instruction in the classroom. The introduction of progress monitoring, particularly in conjunction with Wireless Generation's mCLASS:DIBELS, has changed this considerably. Because teachers have access to the data they collect immediately, which are presented in a format that is readily accessible (it is immediately clear where a student "is"), this data can be incorporated into planning and discussions among teachers as they consider how to group students and provide targeted instruction. In addition, teachers at multiple locations regularly include their students in viewing assessment data. In some settings, students reported their progress to their parents and families. In one particular instance, the parents of a child who was telling them about his results attended a parent-teacher conference wanting an explanation of what their child was discussing. This prompted the teacher to share mCLASS:DIBELS progress monitoring data with all of her students and their families. In other schools, teachers have taught their students how to plot their own progress monitoring data on charts, and encouraged students to lead discussions about their reading progress using these charts during parent-teacher conferences. These are very different approaches to using data than previously existed in these settings before progress monitoring was introduced. Through the implementation of these approaches, students have become more empowered as individuals within the assessment process. They want to understand what is being measured and what their goals are. More engaged in the process, students exhibit more ownership over their own learning, and perhaps feel a greater level of control over their ability to perform as readers.

Teacher Access to Grade Appropriate Goals

The majority of teachers greatly appreciated the clarity and simplicity of the presentation of information associated with the progress monitoring function. While very experienced teachers know what type of text, or fluency of reading, to expect from a student in a given grade, most teachers experience some trouble identifying exactly what a first, second or third grader should be able to do as a reader at grade level. This problem is compounded in schools that serve large numbers of struggling readers. Teachers who have worked with struggling readers year after year can lose sight of what the expectations are of a student who is at grade level. For these teachers, regular access to information about where a student is in relation to expectations for his or her grade level is valuable. The use of progress monitoring ensures that teachers have a consistent and relatively accurate set of goals for their students and that expectations are consistent for all students. In addition, this information allows teachers to continually check on the impact that their classroom instruction is having in relation to reading at grade level.

Each of these three common elements in the administration of progress monitoring has the potential to play a role in increasing student outcomes on the DIBELS measure. While the chance to read connected text may not, on its own, have much impact, the opportunity for a student to receive individualized attention from his or her teacher is positive. In addition, for teachers and students to engage in conversations about student progress furthers their interactions and may encourage students to take ownership over their own academic achievement. At the same time, teachers must have access to accurate information about student reading levels in relation to end goals to determine progress, and make judgments about appropriate and effective instruction. Without concrete goals in sight, teachers will struggle to identify whether a student is or is not making progress. Progress monitoring assists in the creation of clear goals, and provides a consistent set of tools to track progress in reaching those goals.

Other factors should be considered when attempting to understand the relationship between progress monitoring and the student outcomes mentioned above. For example, the regular review and analysis of student progress might cause educators to respond promptly and with more effective instruction that accelerates student growth. As noted above, this effect has been seen in other studies, including many which have monitored teachers' behavior in response to progress monitoring.

It is also important to note the possibility of a "testing effect" associated with progress monitoring producing an increase in student scores with more frequent assessment. The less desirable type of testing effect, in which students end up memorizing test forms and items but do not actually learn to master the broader skill, is most likely eliminated because of the use of alternate text passages.

The more desirable type of testing effect, in which repeated testing reinforces the student's skill and retention, may well be occurring here. This effect has been observed in many high-quality studies conducted in different domains of classroom instruction (Roediger & Karpicke, 2006).

Final Comments

This analysis represents a broad, high-level view of the impact of progress monitoring. Studies which include more contextual information about the specific uses of progress monitoring data (e.g., decision-making protocols and instructional choices) may yield more pertinent information about how to effectively implement progress monitoring to best benefit students. Nonetheless, these findings raise some interesting new questions. For instance, it has been widely accepted that progress monitoring and use of progress monitoring data have important benefits for struggling readers, but these findings imply that there are important benefits for stronger readers as well. More research on why and how this phenomenon occurs may prove quite valuable for schools trying to sustain strong reading growth for all students. Finally, educators continue to grapple with the question: how much progress monitoring is enough? This is an important question, as it is necessary to balance the time spent on assessment and using the data with the time spent on instruction. The findings presented in this study indicate a consistent correlation between frequency of progress monitoring and student reading performance, and support the implementation of progress monitoring at least at the recommended levels by DIBELS authors. However, further investigation may support that, for optimal outcomes for all students, the minimal recommended frequency of progress monitoring should be raised.

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