# From the Laboratory to the Field and Back Again: Morningside Academy's 32 Years of Improving Students' Academic Performance

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## Abstract

Morningside Academy is a third-level scientifically driven service organization (Johnston, 1996) consisting of a laboratory school and outreach to schools and agencies throughout the United States and Canada through its partnership with Morningside Teachers' Academy. The approach blends together a number of empirically validated practices to assist students in achieving academic performance gains. This article describes the three phases—instruction, practice, and application—that make up Morningside's educational programs, outlines the coaching protocol used to prepare teachers to effectively deliver the programs, presents evidence of effectiveness, and calls on our colleagues in basic human research and experimentally controlled applied research organizations to partner with us to answer important theoretical and procedural questions related to our current technologies.

## Keywords

delayed prompting, Direct Instruction, educational programs, educational reform, generativity, Morningside Academy, Precision Teaching, teaching methods, Think Aloud Problem Solving (TAPS).

## ■ ABOUT MORNINGSIDE ACADEMY

Morningside Academy is a behaviorally based laboratory school (Dewey, 1990a, 1990b) that helps elementary and middle school students to catch up and get ahead. It was founded and is currently directed by Kent Johnson. Most of its students did not perform to their potential in their previous schools. Entering students typically score in the first and second quartiles on standardized achievement tests in reading, language, and mathematics. Some have diagnosed learning disabilities; others are labeled as having attention deficit disorder or attention deficit hyperactivity disorder. Some lag behind their peer group for no "diagnosed" reason. Students' IQs range from low average to well above average. A small percentage of students have poor relations with family members and friends, but most do not. Morningside is a school for children with academic behavior problems, not a school for children with social and interpersonal behavior problems.

### ELEMENTARY SCHOOL: FOUNDATIONS

Morningside Academy's Foundations program offers a full day of foundational skills that include reading, writing, math, thinking, reasoning, and problem solving. Elementary school-aged students enroll in the Foundations program for one to three years or more to catch up to grade level. About half of our mid-

dle school-aged students—those who enter without these foundational skills and who require a full day of foundation skills to make a year's progress in school—also enroll in the Foundations program. Many Foundations students who catch up to grade level extend their stay to achieve beyond their grade level. Morningside Academy offers a money-back guarantee for progressing two years in one in the skill of greatest deficit. In 31 years, Morningside Academy has returned less than one percent of school-year tuition.

At Morningside Academy, we construct behavioral repertoires to eliminate (a) deficient basic academic skills, such as reading, writing, and mathematics; (b) deficient learning skills, such as goal setting, listening, noticing, reasoning, thinking, studying, and organizing; and (c) deficient performance skills; that is, skills in performing tasks in a timely, accurate, and organized manner, without disrupting others or causing oneself undue grief. The Morningside program focuses upon these three key academic, learning, and performance repertoires to increase the intensity and explicitness of instruction. The model at Morningside is in direct contrast to compensatory models that teach children to sidestep their disabilities. Instead, at Morningside, we teach students to face their behavioral deficits head on.

The Foundations academic program focuses on reading, writing, and mathematics, including the language, facts, skills, concepts, principles, problem solving, and organizational aspects of each. Literature, social studies, and science provide the content for teaching these foundations in the sense that students learn to read and write about passages from these content areas and

learn to apply math facts and operations to problems that each may present.

Each student participates in extensive entry assessments of academic, learning, and performance skills. Students with similar needs and goals are grouped together for instruction. However, groupings change repeatedly throughout the day as students move from reading to writing to mathematics. Groupings also change continuously throughout the school year as students make more or less progress than students in their current group. There is no hard-and-fast rule about when a student may move to a new group. Later in the article when we describe our assessment process, we'll return to this issue.

The comprehensive reading program includes basic prerequisites such as print awareness, phonemic awareness through auditory blending and segmenting, and the alphabetic principle. Basic foundations in decoding are emphasized, including sound-symbol correspondence, textual blending and segmenting strategies, and reading fluency. Comprehension is a major focus. We teach students to retell stories, passages, and chapters they read, emphasizing main points and proper sequence, first orally and then in written form. Students also learn background information and vocabulary related to reading selections, which are organized according to universal life themes and research themes, to provide solid springboards for later inquiry and research. Both basal reading programs and authentic literature are incorporated. Students also learn over 20 key comprehension skills such as recalling text in sequence, comparing and contrasting, and making inferences. Students learn to "read strategically" by asking questions, making connections with what they already know, making and confirming predictions, applying the comprehension skills they have learned, and so forth. They learn strategies for organizing and communicating their ongoing thoughts during discussion.

The comprehensive writing program focuses on mastery of rubrics for many different genres, including various descriptive, narrative, explanatory, and persuasive writing styles. Students master key component skills in handwriting, keyboarding, word processing, transcription, dictation, spelling, grammar, and mechanics; as well as organizational strategies such as selecting a topic, brainstorming details, and logical sequencing of details, sentences, paragraphs, essays, and reports.

The comprehensive mathematics program includes mastery of counting and the numerical system; math facts and calculation skills; math concepts; math vocabulary and the language of speaking and writing about math, using the retelling methods we employ when teaching reading; and math thinking, reasoning, and problem solving skills.

During the implementation of our foundation programs in reading, writing, and mathematics, we measure student performance on a daily basis. Teachers and students use these data to make decisions about what would be best for the learner to do next. Perhaps the learner needs more instruction in a skill, or maybe more practice. Or maybe a student can skip over some instruction or practice. In fact, learner outcomes making up as much as one-third of a course of instruction may emerge 'for free' along the way, as the component skills that make up an emerging skill are mastered. The specific sequences of skills and the focus upon teaching each skill as a general case make Morn-

ingside programs *generative* in design. *Generative instruction* is instruction that is carefully designed to produce skills that are not directly taught.

## MIDDLE SCHOOL: ADVANCED FOUNDATIONS

In the middle school, students learn advanced foundation skills in reading, writing, and math. They also learn how to study and perform successfully in content classes in the social and natural sciences and the humanities. Subjects include world history, civics, general science, geography and culture, and human relations and communication. Students who enroll in the middle school program typically complete all of their middle school requirements before transitioning to other schools. Their program consists of any foundation skills they may be missing, content courses, and instruction in how to succeed in content courses and project-based learning.

## THE SUMMER SCHOOL

In addition to the academic year programs, Morningside Academy offers a 4-week summer school program that provides morning and afternoon programs in reading, language, writing, and mathematics. Some of our students attend school year round, focusing on their skill of greatest deficit. Many other students who do not have learning or attention problems and who are not behind in school attend Morningside to sharpen their basic skills and develop the necessary foundations for becoming high performers in school. Students typically gain a grade level in the skill area they study. The summer school program offers a money-back guarantee for progressing one year in the skill of greatest deficit. Morningside Academy has returned less than two percent of summer school tuition.

The popularity of Morningside Academy's summer school program with children and youth who are at or above grade level attests to the dearth of good instruction in foundations skills in many public and private schools. All students can benefit from part or all of Morningside's programs. The difference between upper and lower percentile students is the amount of time they need to spend in the Morningside programs. In fact, part of every school day at Skinner, a school for gifted children in Chicago, is devoted to Morningside's reading and math fluency programs.

## ■ ASSESSMENT, CURRICULUM AND INSTRUCTION, AND CLASSROOM MANAGEMENT

### ASSESSMENT

Morningside adopts three levels of assessment: macro, meta, and micro. *Macro-level assessment* or summative assessment judges student performance at the end of a period of time, typically a year, and uses standardized, typically norm-referenced, instruments. These instruments provide a reliable and valid estimate of student progress in relation to children throughout the country. A commonly used macro-level assessment instrument is the Iowa Test of Basic Skills (ITBS, 2001, 2003, 2007). *Meta-level assessments* are administered more frequently—as often as two or three times a month—and are directly correlated with the curriculum. They are both formative and summative. They

are formative in the sense that they allow mid-course correction in the program. For example, if all students appear to be falling short of expected growth, it suggests a need for new program elements or increased teacher coaching. Meta-level assessment also provides the best evidence for changing a student's group membership. For example, a student who is in reading group 3 may demonstrate much steeper learning trajectories than other students in the reading group and may therefore receive a try-out in reading group 4. Alternately, if his learning trajectories are significantly flatter than those of other students in reading group 3, he may be moved to group 2. The important aspect of homogeneous grouping is to maintain parity within the group such that all members can benefit from similar curriculum and procedures. The purpose of regrouping is to ensure that all students can move at their own rate. Meta-level assessment is summative in the sense that it sums up performance at pre-designated periods throughout the year. It also provides social validation of student growth that teachers are reporting in their own classrooms. We use benchmark tests, mastery tests, and an adaptation of the Curriculum-Based Measurement (CBM) strategies developed by Deno (1985), Shinn (1989), and others for this purpose. The third type of assessment, *micro-level assessment*, measures performance daily on a series of component skills that are thought to combine in ways that improve student performance on the authentic tasks that make up the meta-level assessment. For this purpose, we primarily employ the Standard Celeration Chart to track student growth in fluency on these important skills.

Of course, these levels are useful only if we can demonstrate that daily measures of skill growth as reflected by entries on the Standard Celeration Chart (micro-level assessment) correspond to scores on the meta-level assessment instruments (e.g., CBM) which in turn are highly correlated with scores on the more comprehensive and less frequently administered macro-level assessment criterion measures. In response to this question, our school psychologist, Julian Gire, and classroom teacher, Jennifer Testa, developed a model that predicts needed growth in reading on the meta-level assessment instrument—the Scholastic Reading Inventory (SRI; 1999)—to achieve desired growth on the ITBS (2001, 2003, 2007), measured in the spring. The model was built on data obtained from 102 Morningside students aged 9 – 14, of whom 69 were males. Discovering that the spring ITBS and the SRI are highly correlated ($r = .79$ for fall administration of the SRI; $r = .80$ for winter administration of the SRI; and $r = .84$ when both are administered in the spring), they developed a predictive model that would allow them to track improvements on the SRI as a proxy for corresponding improvements on the ITBS. They began by using the spring-to-spring correlation to set an SRI target that would predict two years growth on the ITBS. Then, knowing the starting SRI and the target SRI, they set goals for SRI improvement and predicted accurately the amount of SRI improvement that yielded the desired ITBS score. Gire and Testa's work exemplifies only one of the myriad research questions whose answers can help applied programs like Morningside to achieve the kind of gains children deserve and their parents want.

## CURRICULUM AND INSTRUCTION

As a laboratory school, Morningside focuses upon investigating best practices in both curriculum and instruction. By *curriculum* we mean instructional materials, be they commercially published or designed in-house, that teachers use to teach the instructional standards outlined above. By *instruction*, we mean the methods used to promote learning via the materials, or exactly how students engage with them. One of the primary tasks of the director is to scour the research literature for empirical evidence of promising curricula and instructional methods. When new practices or materials are identified, they compete with those currently in place to teach students. When in-house data demonstrate that student performance improves more with new materials or practices, they replace those currently in use. In this way, Morningside's curriculum and instruction is constantly evolving to achieve greater instructional power. Our current regimen includes three phases of learning and teaching: Instruction to establish initial learning; practice of performance learned during instruction to fluency with celeration; and application of the performance to real-world activities. It also draws heavily on the research related to engineering instruction to encourage the emergence of novel repertoires and on strategies that encourage and improve problem solving. The sections that follow describe these characteristics of Morningside's curriculum and instruction.

*Instruction.* During instruction—Phase 1—we employ two best practices: homogeneous grouping, in which students with similar skills and deficits are grouped together for learning (Slavin, 1987), and mathetics (Gilbert, 1962a, 1962b; Johnson & Street, 2004b). Mathetics is a kind of generalized imitation training during which students learn to imitate the performance of the teacher. It incorporates explicit procedures in three stages: demonstrating and verbalizing the accomplishment of the instructional objective being learned, providing guided opportunities for learners to demonstrate the performance, and finally providing opportunities for students to perform without assistance. These stages occur recursively, depending upon student performance. For example, the teacher may decide she has provided enough demonstration and provide an opportunity for students to move to the "guided opportunity" stage only to observe many student errors. In such cases, she would provide additional demonstrations until it appeared that students "got it." She'd then provide another guided opportunity. Similarly, after students perform accurately with guidance, the teacher will offer a test of performance without guidance. Should students make errors at this stage, the teacher would return to the guided opportunity stage. This recursive process continues until students perform independently and correctly on several trials.

The most well-known version of mathetics is Engelmann's Direct Instruction, or DI (Engelmann & Carnine, 1982) method and its associated instructional materials. During Direct Instruction, teachers present scripted lessons to children, who answer teacher questions in unison. Teacher and students volley many times a minute with their questions and answers. Teachers praise and correct student responses until all children are accurate. The explicitness and careful progression of DI lessons assures that students develop flawless skills very quickly. At

least 170 studies have compared DI to other methods. Of those, 64% significantly favor DI, 35% show no difference and only 1% show differences favoring the other method. With an effect size of .97, Direct Instruction is the most powerful instructional method ever researched in education (Adams & Engelmann, 1996).

Many DI programs are currently available, particularly for the primary grades. Other DI-like programs are available for more advanced learners; for example, Anita Archer's reading (Archer, Gleason, & Vachon, 2000, 2006) and writing programs (Archer, Gleason, & Isaacson, 2007). We also design mathetics lessons and programs for students where none are commercially available, using Markle's instructional design principles (Markle, 1990; Tiemann & Markle, 1990).

*Practice.* Following successful instruction, students begin Phase 2 of learning by practicing their freshly acquired skills until they become fluent or automatic, using Lindsley's Precision Teaching (Pennypacker, Gutierrez, & Lindsley, 2003; White & Haring, 1976, 1980) method. Having fluent prerequisite skills makes learning subsequent, related skills faster and more successful. Students usually practice building skills to fluency in pairs, although sometimes they practice alone or in threes. During practice, students time themselves on specially designed fluency materials until they can perform a certain amount accurately, smoothly, and without hesitation in a certain amount of time. Timings are usually 1 minute, but range from 10 seconds to 10 minutes. Students record their timed performance on specially designed charts called Standard Celeration Charts. A specific minimum rate of expected growth is indicated on these charts. As students practice, they plot their own improvements and compare their progress to the minimum rate lines. Their comparisons tell them whether they are making sufficient progress, or whether they need to call on the teacher or another student for help. Practice is spaced and cumulative in order to maximize its effectiveness. These practice sessions blend the timing, charting, fluency-building, and celeration-building aspects of Precision Teaching and the cooperative learning and peer coaching features of the Personalized System of Instruction (Keller & Sherman, 1974). Such a mix assures that students permanently retain the skills they are taught; can perform them for extended periods; and can easily apply them, both to new learning requirements and in the course of everyday life.

With Precision Teaching, students learn important goal setting, self-monitoring, self-management, organizational, and cooperative learning skills. Students also learn self-management and self-determination through freedom to take their own performance breaks and still meet their expected goals, skipping lessons when they can demonstrate mastery, moving through the curriculum at their own pace, selecting their own arrangement of tasks to accomplish in a class period, choosing their own free time activities, and giving themselves "support card" points, among other opportunities.

Students in the middle school practice content facts and concepts using Lindsley's flash card fluency method known as SAFMEDS (Say All Fast, Minute Each Day, Shuffled; Eshelman, 2004). Cooperative learning techniques such as Slavin's (1990) Student Teams Achievement Division (STAD) also motivate student practice to fluency. In STAD, students practice in small groups, earning points, grades, or privileges for the group by improving their individual performances.

*Application.* After instruction and practice, students engage in the third phase of our learning process by applying the skills they have learned in a new context. Students may read a newspaper and discuss the articles with their peers. A student may also write a letter to the editor of the newspaper about a particular article after learning and practicing the basic rubrics of writing a persuasive essay. The teacher may make a trip to a store where the students have an opportunity to apply newly learned arithmetic skills. The key feature of application activities is that the learner engages in the *same* performance that was instructed and practiced, but now in a wider, real-world context. Whereas the instruction and practice phases primarily involve learning *how* to do or say something, application primarily involves learning the broader context of *when* to perform the *how*.

An important reading application activity in our curriculum involves strategically applying comprehension skills during reading. A group of students take turns reading aloud a selection that was not presented during instruction or practice. At certain points a teacher stops the reading and engages in "think aloud" monologues that model applications of comprehension skills the students have previously been taught. The teacher may pause the group reading at various points to make a prediction about what will happen next or what a character will do, or she may make a connection between the plot or a character and her own life experience. After two or three think-alouds, the teacher uses a "delayed prompting" method to assess and prompt student application of skills. First she calls on a student at certain points during the group reading to make a prediction or connection that will help to make sense of the reading or help the student relate more closely to it. If the student doesn't respond competently, the teacher provides a prompt to adduce the application. If the student's application still does not meet criterion, the teacher may provide more intensive prompts and finally a full model of the application before the student's application is successful. Thus the student stays engaged with the teacher until he is successful, no matter how many volleys occur between them. The teacher provides increasing support until the student is successful. The relevant data to collect are the number and kind of teacher prompts that were provided, not the accuracy of the student's response, since all students stay engaged with the teacher until they are successful.

*Generativity.* At any time in a curriculum sequence, students may encounter instructional objectives and tasks that require new combinations of previously learned elements. More advanced operations in arithmetic, such as long multiplication or division of numbers, are recombinations of previously taught addition, subtraction, and multiplication elements. More advanced forms of sentences and compositions are recombinations of elements learned separately during previous writing instruction. Debating combines elements such as argumentation rules, oratory style, Robert's Rules of Order (2000), and quick refutation. In the Morningside Model of Generative Instruction, teachers deliberately schedule opportunities to perform more complex tasks with little or no instruction, in a process we call *generativ-*

*ity* (Epstein, 1993). They identify upcoming opportunities for recombination in a curriculum sequence, and engineer novel discovery learning activities that require the students to figure out how to perform the recombinations that they have never been directly taught to do. Students may draw new conclusions, perform new operations, infer new knowledge, and so on, based upon their current, relevant repertoires learned earlier in a curriculum sequence. For example, after some comprehension instruction, the learner may be asked to engage in new comprehension skills not yet taught, such as making a prediction at a certain point in reading a selection after learning how to draw a conclusion, or identifying an author's bias after learning about how to identify an author's point of view or purpose (e.g., inform, entertain, persuade). In writing instruction, after learning how to modify nouns with adjectives and how to write dependent clauses, the learner may be asked to write sentences with appositives without any additional instruction beyond a model, such as *The candidate for state representative, a surly and arrogant man, lost the election to a grassroots candidate*. Through the generative process, students may greatly accelerate their progress through a curriculum, demonstrating that objectives typically thought of as harder to learn become easier and easier.

Several researchers have conducted experimental analyses of generativity, defining a procedure they call contingency adduction (Andronis, Layng, & Goldiamond, 1997). In this procedure, two or more performances taught under certain conditions are recruited by new, very different conditions to form new combinations or blends that serve a new or different function, or solve a new problem. In an early demonstration of contingency adduction, Rosales-Ruiz (personal communication, October 22, 2008) and his student, Virginia Broitman, taught a dog to "come" under one stimulus, and "raise its paw while standing still" under a different stimulus. When the stimuli were combined, the dog "limped" forward without being directly trained to do so. Once the new performance was reinforced, it was "adduced by the contingencies." The video they shot of the training is startling and compelling. Layng, Twyman, and Stikeleather (2004) programmed contingency adduction opportunities in an Internet-based program, Headsprout Early Reading. Learners were explicitly taught isolated letter sounds, such as 'c,' 'r,' 'f,' 'l,' 's,' 'p,' 't,' and 'n.' Later, the program says "I bet you can figure out new sounds all by yourself." They were then presented combinations of the isolated sounds, such as 'an,' 'cl,' 'fr,' and 'ip,' and asked to listen and select the correct sound combinations. Data collected from over 11,000 learners showed that between 80% and 95% of learners correctly identified the new sound combinations without any additional instruction. Both of these examples of contingency adduction used a combined stimulus procedure. Researchers have also produced contingency adduction with other procedures, including the oddity-to-sample procedure (Andronis, Layng, & Goldiamond, 1997; Layng, Twyman, & Stikeleather; 2004). Further educational research could have remarkable impact upon accelerating instruction, particularly for students who are behind and need to catch up.

*Think Aloud Problem Solving.* In addition to scheduling opportunities for discovery with little or no instruction, we also make generativity more likely by teaching students a reasoning and problem solving routine. Students learn how to think, reason, and problem solve by talking their way through new problems in reading comprehension, mathematics, social studies, and science using Whimbey's Think Aloud Problem Solving (TAPS) method. This method, initially designed for college students (Whimbey & Lockhead, 1991, 1999) and further proceduralized for younger learners by Robbins (1996), is the core learning-to-learn technology used in our program. In TAPS, teachers model and coach students to think out loud through talking, writing, diagramming, and other supplemental activities which support thinking, using specially designed protocols that represent effective ways to work through problems. Students are taught five key repertoires that are required for effective reasoning and problem solving. Then they coach each other to "get fluent" in using the TAPS protocols and these key repertoires to solve a range of problems. Once TAPS is fluent, they coach each other's use of TAPS to master content and skills across a typical school curriculum, such as social studies, science, and math. They also use a version of TAPS to edit and improve their writing skills.

Middle school students also apply TAPS to cases of practical deliberation taken from daily life. John Dewey described the importance of this work in his book, *How We Think* (1986a). Teachers apply TAPS to situations such as the best way among several alternatives to reach a destination within a given time frame. Students select situations from their own lives to "TAPS." Students also apply TAPS as they reflect upon things they observe, such as how a back porch they see on the way to school was probably built. In the gradual shift from teacher-directed to student-directed learning, students master learning skills using Think Aloud Problem Solving, which weans them from teacher dependency to independent learning.

Whimbey and Lockhead (1999) and others have demonstrated that they can improve problem-solving and reasoning abilities of college students through the use of a TAPS approach. However, much of the data uses pre- to post-test gains and the model has not been subjected to a rigorous experimental test. At Morningside, students' standardized test scores have improved since TAPS was introduced, but its introduction has coincided with other curricular and instructional program changes. Its function as a *generative repertoire* that facilitates blending of component skills as needed to engage in a novel performance, with little or no instruction, remains to be empirically tested. It is also not clear how TAPS works, if exposure to problem-solving and reasoning activities alone would have a similar impact on performance, or which of its several components contribute to its overall effectiveness. TAPS is an area ripe for research, particularly during a time when there is a call in educational and training circles for efficient and elegant programs that will improve problem solving and reasoning.

*Project-based learning.* Project-based learning is currently popular in many educational settings beginning in late elementary school and continuing through college. In project-based learning, activities are made up of challenging compound skills to stimulate creative principle application and problem solving. The approach typically assumes that students can perform all the component skills that the larger, compound activity requires. The generative instruction model also places a premium

on creative principle application and problem solving, but it first assesses students' component repertoires to assure they are at strengths that predict their application.

Project-based learning arrangements that we've incorporated in our middle school derive from Dewey's (1916, 1986b, 1990a, 1990b) inquiry-based learning which emphasized teaching in real-world contexts. Dewey saw the value in explicitly teaching specific skills—skills the Morningside Model of Generative Instruction describes as component skills. In his model, learners needed to engage in inquiry all the time, with time out for teaching and learning the component skills along the way. Most proponents of his theory have dropped the explicit teaching of component skills during inquiry. Thus, the typical project-based learning arrangement can be thought of as an "upside down" approach to curriculum planning: the compound comes first, out of which both compound and elemental skill learning are expected. Some educators think projects are inherently interesting and stimulating and believe these anticipated motivational features outweigh component skill weaknesses. The assumption is that, if the task is sufficiently interesting, learners will employ a battery of skills to figure it out. In the end, some learners do, and some learners don't. While we agree that meaningful projects are important educational endeavors, we design Dewey's (1916, 1938, 1986a) progressive, real-world applications by introducing compounds later in what we believe is a "right side up" sequence of instruction that teaches from elements to compounds.

*Fluent Thinking Skills.* The middle school program explicitly teaches everything from textbook reading and studying and lecture note taking and studying to participating in class discussions, test taking, and essay and report writing. As students study, they use Robbins, Layng, and Jackson's (1995) Fluent Thinking Skills method. This method teaches students a specific question-generating and answer-predicting method that points out discrepancies between what they already know and any new learning that they need to do, greatly reducing their study time.

*Summary.* We have defined the key technologies of the Morningside Model of Generative Instruction as if they occur in a linear sequence (DI + PT + delayed prompting + TAPS), with clear transitions from one to the next. When observing our classrooms, colleagues will often point to aspects of one technology in the context of another. For example, teachers may employ timings, a feature of Phase 2: Practice, during Direct Instruction boardwork in Phase 1: Instruction. DI correction procedures may be used as interventions during Precision Teaching timings in Phase 2: Practice. TAPS may be used during independent work in the instruction and practice phases, and so on. Mixes and matches of technologies, as student performance suggests, create a seamless blend of research-based best practices.

#### CLASSROOM MANAGEMENT

Morningside Academy's teachers coach students to perform their best. Teachers coach performance with clearly defined rules and expectations for performance and productivity, explicit modeling of high-performance skills, and moment-to-moment monitoring and feedback. Chapter 9 of our book (Johnson & Street, 2004b) describes the use of what we now call a "daily support card" to ensure that students in our busy, high-

energy classrooms are on-task and academically engaged. At the beginning of each day, students receive daily support cards which list their classes and identify four skill categories—academic, learning, organization, and citizenship—in which points may be earned. Teachers in each class clearly specify expectations and post reminders on the wall. They set aims for the number of points the student is expected to earn in the four skill categories and distribute points throughout the class period either for achieving an outcome or for making substantial progress toward it. In addition, students can earn bonus points for extraordinary performance. The final class period teacher meets with each student each day, totals his or her performance, and circles the "Kind of Day" s/he achieved in each category: a "+" indicates that the student exceeded the day's total aim; an "=" indicates that the student met the day's goals; a "✓" indicates that the student missed the total aim by two or fewer points; and a "—" indicates missing the goal by three or more points. The teacher writes summary comments, records their scores, and gives the cards to the students. Classroom wall charts display the points that each student earns. In addition, students share their support cards with their families each day. Many students earn home-based rewards such as extra television, computer time, or telephone time for meeting their aims. Family conferences are scheduled for students who earn more than three consecutive minuses.

We use the daily support card to achieve at least three purposes. First, it reminds teachers to observe and respond to student behaviors. Second, it reminds students of their goals, prompts appropriate performance, and provides concrete evidence of progress. Last, it serves as a relatively easy-to-administer token economy. Because some students continue to need consequences in addition to the social reinforcers teachers provide and the benefit of a job well done, the daily support card allows a mechanism whereby parents can provide backup reinforcers for progress on academic and behavioral goals.

### ■ TECHNOLOGY TRANSFER THROUGH COACHING

As Pennypacker (1986) noted, technology transfer is critical if programs such as those developed at Morningside Academy are to achieve global impact. Further, the literature on school reform (Curtis, Castillo, & Cohen, 2008; Curtis & Stoller, 1996; Sugai & Horner, 2005) describes the challenges inherent in system-wide change. Through Morningside Teachers' Academy, the outreach branch of Morningside Academy, programs and practices that have been adopted and proceduralized at Morningside Academy are implemented in schools and agencies throughout the United States and in other countries as well. Although the Morningside Model of Generative Instruction has been adopted by more than 125 school and agencies and although there have been many remarkable successes, achieving the kind of system-wide change we know is needed continues to be a challenge.

We have learned, however, that teachers hold the key to an educational program's success or failure. While we agree that good curriculum materials are a necessary condition to their effectiveness, they alone are not sufficient. Teachers must be masterful in implementing curricular, instructional, and management practices; but more than that, they must understand the

rationale behind them in order to apply the most appropriate practice to situations that emerge, to assess their effectiveness, and to make changes that the data recommend.

Even when one has mastered the verbal repertoire, can state the rationale, and knows when use of the practice is appropriate; learning how to employ the skill in the real-world conditions of the classroom requires instruction and coaching. Add to this the mountain of data that suggest that none of us is very good at observing our own behavior, and it is clear that mastery requires that someone else watch and give us feedback. We would never expect even the most gifted athlete to perform without a coach and yet we see very little coaching of teachers. Further, for teachers, the classroom is the ultimate game day situation and no amount of in-service training sessions can prepare them for its complexities. To be effective, teachers need coaching to master their "do" repertoires and this practice eventually must occur in the natural environment, their classrooms. Our understandings were affirmed by a 1987 meta-analysis by Bennett in which he found that while teachers learned about 60% to 80% of knowledge-level material presented by lecture alone, they acquired only about 10% of related skills, and applied from 2% to 5% of the skills. In other words, their "do" repertoires weren't substantially improved by lecture alone. When demonstrations were added to lectures, knowledge acquisition rose to 80% and skill acquisition rose to between 10% and 40%. However, skill application remained at the same low level. Skill acquisition hit 60% when practice and feedback was added, but the other levels remained the same. It wasn't until in-class coaching was added that all three areas—knowledge acquisition, skill acquisition, and skill application—reached 80%. Other work by Joyce and Showers (1995), which also substantiates the importance of in-classroom coaching in staff development, have led us to develop and refine our own program of intensive coaching.

It is based on these findings that we require a commitment to coaching teachers in schools that invite us to implement our programs and practices. In her doctoral dissertation, March (2011) mentions several approaches to coaching and highlights four of them: peer coaching, cognitive coaching, literacy coaching, and instructional coaching. The Morningside coaching model is most consistent with the instructional coaching model, which March describes in this way:

> Instructional coaches focus their efforts on a broad range of instructional issues within the school such as classroom management, specific instructional practices, reading and mathematics content, and formative assessment. Regardless of the focus, instructional coaches assist teachers in implementing and refining evidence-based practices to enhance student learning. According to this model, instructional coaches employ seven practices while working with teachers: enrolling the teacher to build rapport and establish expectations, collaborative planning with the teacher, modeling the lesson for the teacher, teacher-directed post conferencing to discuss the modeled lesson, observing the lesson being taught by the teacher, collaboratively exploring the data collected during the observation with the teacher, and providing continued support while the teacher builds fluency with the new skill or practice. (p. 60)

The purpose of the following section of the article is to provide an overview of the content for which we provide training and coaching, describe the generic training and coaching model we use to ensure that teachers know "what" and "when," and describe the steps in the coaching model.

## AREAS FOR TRAINING

Morningside Teachers' Academy provides training in three areas that are critical for teachers to develop the level of fluency required to be successful in the classroom. First, they learn about the Morningside Model of Generative Instruction (Johnson & Layng, 1994; Johnson & Street, 2004a; Johnson & Street, 2004b). This includes introduction to the underlying *philosophy* which provides familiarity with and mastery of the concepts of generativity, mastery learning, and fluency, among others. To ensure good and speedy communication about philosophy and practices, teachers also become conversant with key *terminology*. For example, we ensure that teachers can provide definitions, examples, and non-examples of terms like generativity, tool skills, component skills, composite skills, and learning channels, among others. Last, teachers master specific and generic procedures that underpin the model. These include routines that are commonly employed in Direct Instruction (Engelmann & Carnine, 1991), the charting and decision-making practices associated with Precision Teaching (Pennypacker, Gutierrez, & Lindsley, 2003), and the speaker and listener roles that underlie Think Aloud Problem Solving (Robbins, 1996; Whimbey & Lockhead, 1991). It also includes the scope and sequence as well as the specific routines that are employed in a variety of highly effective curricula including, among others, Robert Dixon's *Reading Success* (2008); Anita Archer and colleagues' *REWARDS* (2000) and others in the series; Engelmann's (2008) *Reading Mastery Signature Edition;* and *Saxon Math* (Larson, Hake, & Wrigley, 2011). In addition, Morningside has developed its own, not yet published, *Persuasive Writing Program*[1], among other internally designed efforts. Last, we teach about and provide practice related to several generic approaches that the Morningside teachers, programmers, and consultants have developed and continue to perfect including boardwork, delayed prompting, and group story reading.

Two critical types of learning are monitored during training. First, we assess teachers' intraverbal repertoire by asking them to define and describe terms and processes and to identify and generate examples and non-examples of concepts. Teachers demonstrate proficiency and fluency in interviews (vis., the Ferster Interview Technique in Ferster and Perott, 1968); timed written and oral checkouts; and games.

## PRACTICE

As teachers begin to develop their verbal repertoires with respect to procedures, we intersperse a series of intensive practice sessions during which teachers provide evidence of procedural integrity. These sessions are crafted by trainer/coaches (T/C) who *segment* long procedures or protocols into teachable units. They then *model* the protocol. Modeling is a process in which the T/C shows the teachers-in-training how the protocol should look. The T/C may provide a live model or show video clips of

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1 For information about this program, contact the first author.

teachers employing the protocol in their classrooms. The T/C follows the model with a *demonstration* of the protocol in which they ferret out and emphasize the critical components of an action. Returning to the sports metaphor, a softball coach might provide a real-time model of good versus poor pitches after which he might use slow motion to demonstrate the critical features of both effective and ineffective pitches.

T/Cs also provide purposely flawed models and provide opportunities for workshop participants to catch the errors. They ask questions like, "What is wrong," "Why is it wrong," and "What should happen instead?" T/Cs stop at various points in the protocol and ask workshop participants to say what comes next. They prompt and shape workshop participants' performances during successively more complex role-plays.

Instrumental to the coaching process is a series of coaching forms (see Figure 1), developed and improved over more than 30 years by Morningside Academy staff. These forms remind teachers of the important steps in a protocol. They also provide the mechanism for data collection on key steps.

When a teacher's performance is accurate and at a useful frequency, practice moves to "real world" settings: the teachers' own classrooms. We do this because we know the limitations of role plays. While role plays provide important and good first opportunities for coaching, they fail as a complete approach for several reasons. First, peers are pitiful actors. Second, it's hard to replicate the pitch and pace of the classroom. Third, role-plays are relatively safe; the stakes are not nearly so high as they are in the real classroom. This safety can produce results that don't hold up in actual classroom settings.

## COACHING IN TEACHERS' CLASSROOMS

The workshops provide an opportunity for T/Cs to get to know the teachers as a group. However, our T/Cs go a step further, exploring common interests with teachers whose classrooms they'll enter. They also identify other teacher repertoires that may be helpful in the coaching scenario; for example, knowing that a classroom teacher also teaches piano allows the T/C to draw analogies from the teaching of piano to the teaching of reading. During these "getting to know you" conferences, the T/C attempts to discover the level of intrusiveness the teacher prefers. This important step helps to avoid embarrassing the teacher in front of her students.

There is also a pre-coaching meeting just before each coaching episode, during which the teacher and coach set expectations for the visit. They review the coaching forms that the T/Cs will use; agree on the skills that will be the focus of the session; seek the teacher's agreement for "live" interventions; and encourage the teacher to advise the students of the role of the coach, even providing examples of what to say.

Once the coaching session begins, the teacher performs the protocol with students while the coach observes and records data on the corresponding coaching form. The coach positions herself where she can see both the students and the teacher and maintains contact with the teacher, using short social exchanges, eye contact, and gestures. She monitors her body language and maintains a positive attitude throughout. When the teacher's performance matches the protocol, or demonstrates good judgment about a deviation, the coach provides positive but relatively unobtrusive feedback so as not to interrupt the flow of the lesson.

When the teacher's performance falls outside of the desirable range, the coach analyzes the teacher's errors to determine their source. Some examples of common sources of errors include that the teacher is not scanning the entire classroom and thus misses children's errors or fails to provide opportunities to all children. Or the teacher applies a procedure correctly, but in the wrong circumstance. Or the teacher's rate of volleys is too low.

When the teacher's performance falls outside the desirable range, the coach analyzes the teacher's errors and intervenes with successively more intrusive support. At first she may employ previously agreed-to signals for particular behaviors; for example they may have agreed that the coach will use the American Sign Language "look around" sign to remind the teacher to scan the entire classroom. She may use what we at Morningside call "Tips & Quips," quick reminders to employ a strategy the teacher has correctly used in workshops. For example, the coach may say "Praise more than correct." or "Verify, Randomize, Individualize, Pace." As a last resort, the coach may provide a live demonstration and then ask the teacher to try it.

At Morningside Academy and even in schools and agencies where our programs are implemented, we realized early on that students can be a powerful source of support for a novice teacher. Many of them quickly become competent with the routines and can provide occasional coaching. Some students enjoy catching teacher errors, but they also provide positive strokes, especially to new teachers. When students and teacher have a positive and encouraging relationship, students can be enormously helpful to the teacher as she proceeds from halting to fluent performance.

## COACHING FOLLOW-UP

Following a classroom visit, the T/C does a quick "touchdown" with the teacher – a minute or two of summary comments and questions – and sets a time for the post-coaching follow-up. During the follow-up session, the teacher and the T/C review the data on the coaching form, identify areas of strength and challenge, and make a plan for improvement.

The coach also provides the teacher with a written feedback report—that same day if possible—in which she includes honest praise for specific strengths, citing examples, and honest criticism for specific skills that need improvement. She may also suggest resources for improvement. These may include video clips showing expert teachers using the routines, or references to particular sections of the teacher's manual for the program the teacher is implementing. The coach may suggest that the teacher consult with or observe other teachers in the school who have already mastered the procedure and who have expressed a willingness to serve in this role, keeping in mind any personality conflicts that need to be avoided. If it appears that the teacher is missing steps in the routine, the T/C may offer a time for more role-play practice. She may suggest that the teacher record and observe her own teaching using the coaching forms that are appropriate.

When they meet, the coach will review the written feedback report. Together, the coach and teacher analyze the skills needing improvement and determine the source of each problem.

**Morningside Academy**

**Boardwork**

Teacher _____    Coach _____    Curriculum _____

School _____    Date _____    Return _____    Date 1 / Date 2 / Date 3

**KEY: Good=3  OK=2  Attempted=1  Not yet=0**

| Observation | | | |
|---|---|---|---|
| **Getting Started** | #1 | #2 | #3 |
| Reading Schedule is visible. | | | |
| Expectations stated before boardwork begins. | | | |
|     e.g., sit tall and proud, strong voice, follow along, answer when asked | | | |
| Comments: | | | |
| | | | |
| **Seating Arrangement** | #1 | #2 | #3 |
| All students can see the teacher presentation material | | | |
| Teacher can see all students and verifies eyes are in the right place | | | |
| Comments: | | | |
| | | | |
| **Following the Protocol** | #1 | #2 | #3 |
| Boardwork list is instructionally appropriate | | | |
| Teacher signals correctly and students respond together | | | |
|     Circle part not done correctly:  **focus    think time    response signal** | | | |
| Teacher uses appropriate pacing between items | | | |
| Teacher does step 1: Train-it up & verifies | | | |
| Teacher does step 2: Pick up the pace - Bottoms-up | | | |
| Teacher does step 3: Mix-it up | | | |
| Teacher does step 4: Individual firm-it-up | | | |
| Teacher does step 5: Speed-it up - used as a delayed test as needed | | | |
| Teacher catches & corrects all errors | | | |
| Error correction used was appropriate | | | |
| Teacher is scanning and observing students | | | |
| Teacher went back to retest errors | | | |
| Comments: | | | |

**Points Possible: 48**      **Totals:**

| | | | |
|---|---|---|---|
| Totals: | 0 | 0 | 0 |

| Date | Duration | Student Responses I=on signal  •=not on signal | Teacher Praise Rate I=specific  •=prompt |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

| GLOWS | GROWS |
|---|---|
| | |

©Morningside Teachers' Academy

*Figure 1.* Morningside Academy coaching form for use in coaching teachers' mastery of "boardwork."

Perhaps the difficulties in implementing the routine result from classroom or behavior management that is not fluent. Or perhaps the teacher misunderstands the procedure. Or perhaps she understands the procedure and knows the steps but simply lacks fluency in implementation.

During the feedback session, the coach and teacher design a follow-up plan. Later, the coach records, files, and, if appropriate, disseminates feedback to the teacher's supervisor. She schedules another observation at a time when the teacher has had an opportunity to practice and make improvements.

As teacher performance improves, the number of coaching visits decreases. However, the evidence suggests that continued, occasional coaching is necessary for many teachers to maintain performance.

## WHEN COACHING IS INEFFECTIVE

If several teachers are stuck on similar routines, it may provide evidence that the training workshop needs to be revised. In such cases, it is best to do the tune ups and schedule additional training. However, if only one teacher is stuck on a procedure, the coach may ask the teacher to tape a lesson. Then the two of them together evaluate the performance frame by frame, focusing on one or a few skill sets that hold the most promise for improving performance, using the coaching form as a guide about what to focus upon. Depending on what is revealed in the tape, the coach may ask for more tapes, or schedule additional in-classroom observations. The coach also may need to determine if the skill deficit reflects disagreement with the protocol and, if so, to address the matter directly. Should there be evidence that a teacher is purposely undermining the program, the coach will typically address the problem with the Morningside director and together they decide if the matter should be brought to the attention of the teacher's supervisor.

## THE BOTTOM LINE

At the end of the day, the goal is improvements in students' daily celerations (e.g., Standard Celeration Chart data) on tool and component skills and in the scores from their meta-(e.g., Curriculum-Based Measurement; Deno, 1985; Shinn, 1989) and macro-(e.g., Iowa Test of Basic Skills, 2001, 2003, 2007 or Woodcock-Johnson III Tests of Achievement, 2001) level assessments. Because of the power of the programs and practices we employ, when improvements in these scores aren't forthcoming, we look for other sources of error including training errors or counterproductive school-based contingencies.

## COACHING FOR COACHES

The coaching repertoire itself requires instruction and coaching. To ensure that coaches are well trained, they work together with more experienced coaches to learn the ropes. They learn, for example, to use the least intrusive intervention possible to achieve the desired outcome and to avoid taking over the classroom or "showing off." They learn to focus on what teachers are doing right and reinforce those behaviors. They also learn to first identify errors that, when corrected, will cause the greatest change in performance.

## INSTITUTIONALIZING THE PROGRAM IN SCHOOLS AND AGENCIES

Morningside doesn't want to stay in each partner school forever, so efforts begin early on to institutionalize the program. There are several steps to this process. Perhaps most important is the training of an in-house coach. In some instances, this may be the principal, but other instructional leaders or master teachers also serve this purpose. In some schools and agencies, different personnel become the local expert on different aspects of the program. For example, one person may develop expertise with Elizabeth Haughton's (1999) *Phonological Coding* and another may become the Standard Celeration Charting whiz. Yet another person may become the local expert on assessment.

These people are selected on the basis of their ability to work well with their colleagues. The Morningside coaches and trainers work with them to strengthen their skills as mentors and coaches. The in-house coach may shadow the Morningside coach on several visits and compare notes after the session. On subsequent visits, the in-house coach takes primary responsibility and the Morningside coach serves as his or her coaching coach. Once skills are firm, in-house coaches stay in e-mail and telephone contact with the Morningside coach to seek advice and to confirm the validity of their decisions.

Partner schools are encouraged to identify these in-house coaches early on in the implementation process so they can participate in the Summer School Institute. During the institute, Morningside consultants and trainers—sometimes the same consultants and trainers who work at their home schools; sometimes not—observe their coaching and provide additional feedback. The institute also provides these in-house coaches with the opportunity to observe expert teachers implement programs and procedure.

## QUESTIONS THAT REMAIN

We are heavily invested in coaching as a primary mechanism to ensure that teachers implement programs and practices with integrity. Our coaching repertoire has been shaped over time, and we have seen its benefit in improved student performance. Still, it and its elements have not been empirically tested. As March (2011) points out, this is not uncommon. She notes that, although much is written about the importance of coaching, there is a dearth of well-controlled research studies that attest to its benefits and that tease out its critical features. To the macro-level questions that March poses, we could add our own, some of which are at a more micro level, including:

- At what point in acquisition should coaching move to the teacher's classroom?

- What if any advantages might be gained by using a modification of Kogan's (1978) bug-in-the-ear technology to assist with in-classroom coaching similar to Bijou's use of it as reported in Morris (2008)?

- How might outcomes management data (viz., Reid, Parsons, Lattimore, Towery, & Reade, 2005), specifically the performance of students in a teacher's classroom, provide additional support for the efficacy of the training and coaching model?

- Might more systematic use of a pyramidal or triadic training model (viz., Parsons, Rollyson, & Reid, 2004; Reid, Green, & Parsons, 2003; Reid & Parsons, 2002) be helpful in preparing in-school coaches?

**MORNINGSIDE READING
@ FORT FRASER ELEMENTARY, BRITISH COLUMBIA
CTBS NATIONAL PERCENTILES**
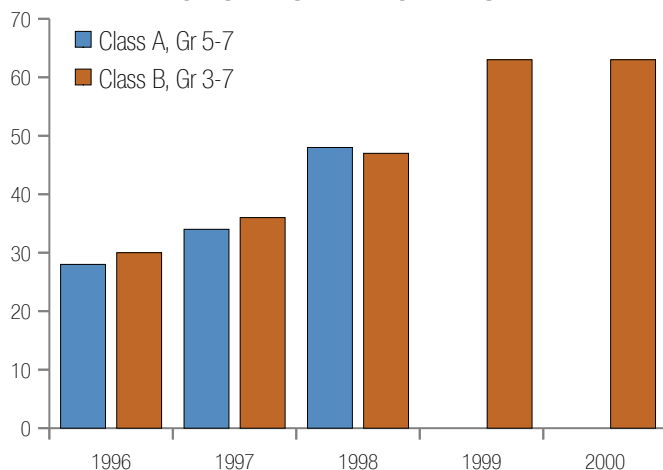


*Figure 2.* Reading data from a Morningside implementation at Fort Fraser School in British Columbia, Canada

**MORNINGSIDE MATHEMATICS
@ FORT FRASER ELEMENTARY, BRITISH COLUMBIA
CTBS NATIONAL PERCENTILES**



*Figure 3.* Mathematics data from a Morningside implementation at Fort Fraser School in British Columbia, Canada

- What school-based contingencies support teachers implementing programs with fidelity?

## ■ EVIDENCE OF EFFECTIVENESS

As a service-oriented program, our primary interest is in student performance. Specifically, we are interested in the degree to which their performance following implementation of the Morningside Model of Generative Instruction reveals an improvement in learning trajectory. We are first interested in performance of students in the laboratory school and then in schools and agencies where our programs and practices are adopted. Generally, we expect the greatest growth where we have the most control over teacher quality and treatment integrity—in the laboratory school. In implementations outside of the laboratory school, we look for learning trajectories that are an improvement over historical trajectories. When these changes do not obtain, we first look at any data we may have on treatment fidelity to see to what degree it may influence performance. We also ask questions about similarities and differences in the student population or school culture that may have moderated outcomes.

In this section, we present data on the effectiveness of programs offered at the laboratory school in Seattle and on the effectiveness of the programs which have been implemented in schools and agencies throughout the United States and Canada. These data come from the macro-level assessment we described earlier and are summative in nature. In most cases, we refer to growth in percentile ranks and grade equivalent scores, mindful of the difficulties inherent in them. That's because growth, characterized in this way, has been required by funding agencies and others who review our work.

Although the data speak for themselves, a summary lead may be appropriate here. At the laboratory school and in most of the schools where we've been invited to implement our programs, children come and go throughout the year; further, in our partner schools and agencies, it's not at all uncommon for contracts to be finalized after the school year has begun. We believe it is
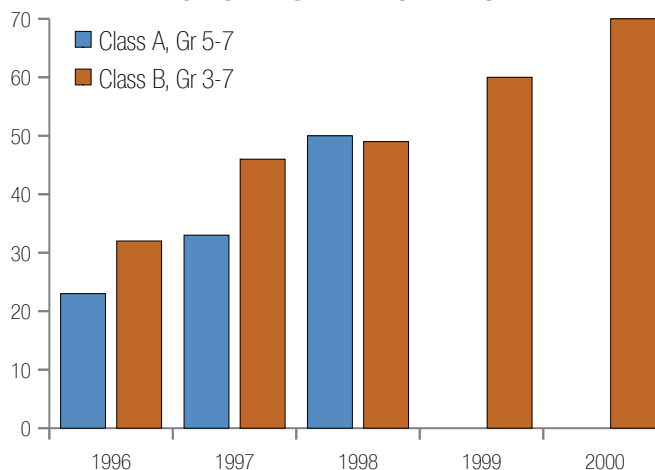
a major tribute to the power of the interventions we use that we are able to begin mid-year, coach teachers to use programs and routines many of which are completely unfamiliar to them, integrate new students into programs, and still see gains that surpass historic gains for children in the programs we serve. We would be remiss not to credit the tremendously creative and empirically based colleagues whose programs we incorporate into our technological mix. Some of them are noted throughout this article; others have been noted in our text (Johnson & Street, 2004b) and in other publications.[2]

The remarkable results of Morningside Academy's initial 11-year study of its children's mean standardized test gains in reading, language arts, and mathematics have been reported elsewhere (Johnson & Layng, 1992). During that time, reading averaged 2.5 years growth per school year, growth in language arts approached an average of four grade levels, and mathematics scores rose to more than three grade levels of improvement per school year.

A systematic and thorough laboratory school evaluation ended in 1992. Since then, however, we have continued to assess students each year in September and June on a variety of in-house, state, and national measures. Since its beginning, Morningside Academy has served several thousand children in the laboratory school. Children's median achievement test performance gains remain above two grade levels per year in reading, language arts, and math. In addition, we continue to offer a money-back guarantee that requires us to return tuition to parents whose children don't gain at least two years in their area of greatest deficit. We do this despite the fact that, as a laboratory school, we are constantly trying out new programs, protocols, and routines. As we reported earlier, we rarely have to make good on the guarantee.

Since 1991, Morningside Teachers' Academy (MTA) has successfully implemented programs in over 125 schools and organizations with over 40,000 students in Illinois, Washington, Geor-

2 For a full list of programs we currently use, contact Morningside Academy at 206-709-9500 or kent@morningsideacademy.org.

gia, Pennsylvania, British Columbia, South Dakota, Oklahoma, Hawaii, and Utah. Students in the Chicago Public Schools, the Nechako School District in British Columbia, the Seattle Public Schools, DeKalb County Georgia Public Schools, and elsewhere have profited from our services. MTA has also contracted with several First Nation and American Indian schools in British Columbia, Washington, Montana, South Dakota, and Oklahoma, assisting them to develop programs in their schools and adult literacy centers. Adult learners in the City Colleges of Chicago and at Motorola Corporation in Phoenix have also made enormous strides in their reading, writing, reasoning, and math skills. A sampling of standardized achievement test results for these external partnerships, some of which also are presented in our book (Johnson & Street, 2004b) is presented below.

Elsewhere (Johnson & Street, 2004b), we have reported gains at Fort Fraser Elementary School, a small rural public school in northern British Columbia, following their partnership with MTA, but they bear repeating here. Figure 2 and Figure 3 show Fort Fraser's student gains in national percentile ranking in reading and mathematics respectively on the Canadian Test of Basic Skills (CTBS; 1998) over a 5-year period for students in grade five through grade seven and for students in grade three through grade seven. Both groups made steady gains in both mathematics and reading percentile ranking, achieving scores at the national norms within two years. After four years, both groups ranked well above average in both reading and math, and student performance had risen from a ranking of thirteenth in a district of 25 schools to second in math and fifth in reading. Writing performance, which was systematically measured in one year of the project, improved as well. At the beginning of the year, only 39% of students were at grade level. After nine months, 80% of students were at grade level.

MTA-certified programs have similar effects in the primary grades. Figure 4 and Figure 5 show how the distribution of first grade students' national percentile ranks on reading test scores

**MOUSE MOUNTAIN ELEMENTARY SCHOOL GRADE ONE STUDENT READING PERFORMANCE FALL, 1996 AND SPRING, 1997 GATES MCGINITIE TEST OF READING**
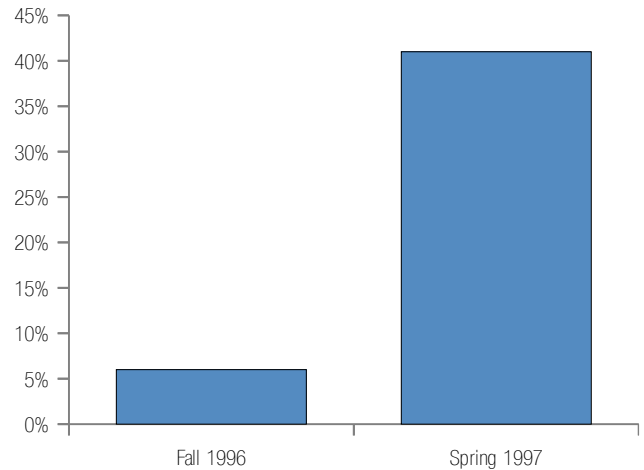PERCENT OF GRADE 1 STUDENTS "ABOVE AVERAGE"

*Figure 5.* Increases in students' percentage of reading "above average" following a Morningside implementation among first graders at Mouse Mountain Primary School in British Columbia.

at Mouse Mountain Primary School in British Columbia shifted in one school year.

Morningside Teachers' Academy has worked equally well in urban schools with students from economically impoverished backgrounds. For the three Seattle School District schools whose data we report here, 76%, 64%, and 81% of their students qualified for free lunch compared to 44% in the school district. Only eight other schools in the district had 75% or more students who qualified for free lunch. The average Washington Assessment of Student Learning (WASL; Washington State Office of the Superintendent of Public Instruction, 1996) reading gain in those eight schools since the test was instituted in 1998 was 7%. The average WASL reading gain in the three schools that implemented MTA reading programs was 22%. Figure 6, Figure 7, and Figure 8 show WASL results, which are reported as the percent of students who met or exceeded ("passed") the state standard, for grade four students in schools that implemented MTA reading programs. In each figure, the 1999 data represent results prior to MTA implementation. The 2000 and 2001 data show the results after MTA reading programs were implemented.

Each year shows four bars. The first bar indicates the percent of students who passed the reading test. The second bar indicates the percent of students who passed the math test. Since MTA did not implement a math program in these schools, these data serve as a quasi-experimental control. The third bar indicates the percent of students who passed the reading test across the Seattle School District. The fourth bar indicates the percent passing the reading test across Washington State. In each case, (a) substantial gains occurred after MTA reading was implemented; (b) all three schools were rapidly approaching average district and state levels; and (c) math percentages did not increase, providing some confidence that other changes in the school were not responsible for the growth in reading achievement.

**MOUSE MOUNTAIN ELEMENTARY SCHOOL GRADE ONE STUDENT READING PERFORMANCE GATES MCGINITIE TEST OF READING**
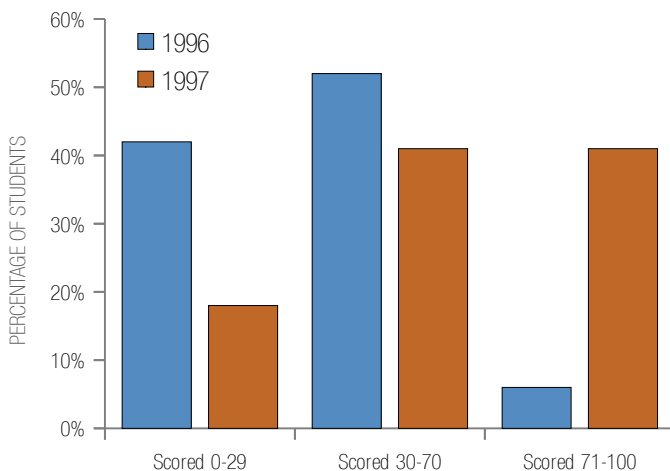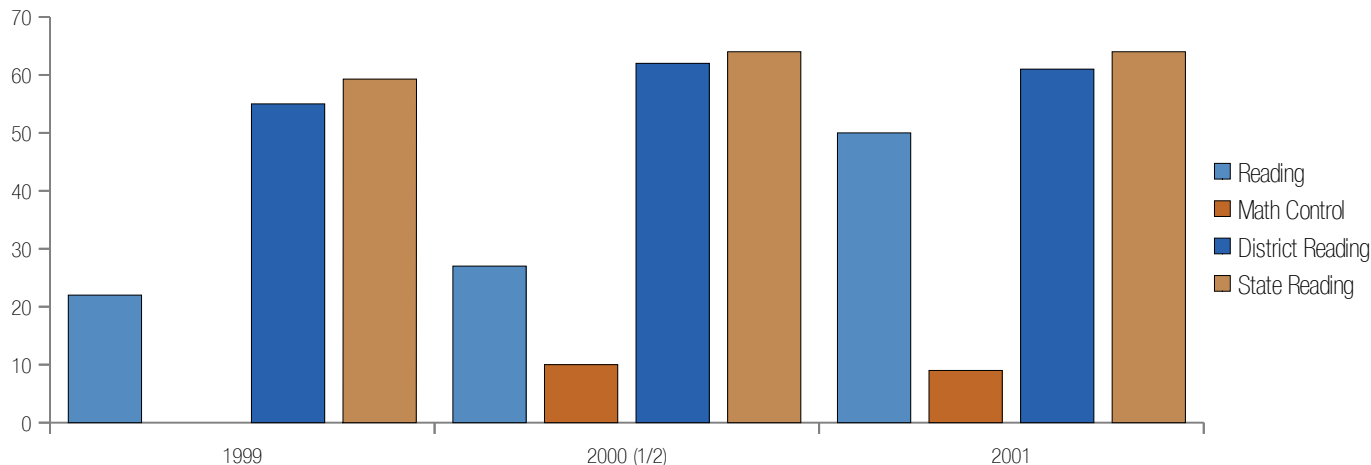FALL 1996 AND FALL 1997

*Figure 4.* Improvements in national percentile rank in reading following a Morningside implementation among first graders at Mouse Mountain Primary School in British Columbia.

**THURGOOD MARSHALL WASL READING ACHIEVEMENT BEFORE AND DURING MORNINGSIDE SERVICES**
(WITH TM MATH, DISTRICT READING, AND STATE READING COMPARISONS)



*Figure 6.* Improvements in reading scores on the Washington Assessment of Student Learning (WASL) following a Morningside implementation at Thurgood Marshall Elementary School in Seattle, WA.

In 1995, an MTA summer school skills enhancement program for 176 Seattle Public Schools fifth graders who were at-risk for advancing to middle school posted impressive scores as well. Students studied two of three foundations areas (reading, writing, and/or mathematics). During the five-week program, 80% (141 students) gained at least eight months in grade equivalent scores in at least one skill area, and 62% (110 students) gained at least eight months in their skill of greatest deficit.

Morningside Teachers' Academy participated in the original Chicago Public Schools' Children's First Initiative from 1996-1998 at the invitation of city mayor, Richard Daley. Seventeen schools in the district volunteered to partner with MTA. In the initial pilot project, after seven months of MTA reading programs, eighth grade students at Carter-Woodson Elementary School in Chicago gained an average of 2.3 grade levels on the Metropolitan Achievement Test 6. Not a single student was at grade level at the start of the program. Within seven months, 27% of the students were at grade level.

Figure 9, Figure 10, and Figure 11 provide evidence of Morningside's impact on student growth in reading as measured by the ITBS at three schools in the Chicago School District: Hearst Elementary, McKay Elementary, and Herzl Elementary. The figures show historic growth of students before Morningside, expected growth of one year for one academic year or 10 months of seat time, and actual growth following implementation of Morningside programs and practices. Students at Hearst (Figure 9) were gaining 8 months a year before and 12 months after Morningside. Growth at McKay (Figure 10) grew from 8 months a year to an impressive 15 months. At Herzl (Figure 11), growth improved from 8 months to an even more astonishing 20 months. These same data are presented in tabular form in Table 1.

Figure 12 presents summary data in reading comprehension performance averaged across the 17 Chicago Public Schools that partnered with MTA. It shows the percentage of students that were at or above the 50th percentile in reading comprehen-

**EMERSON WASL READING ACHIEVEMENT BEFORE AND DURING MORNINGSIDE SERVICES**
(WITH EMERSON MATH, DISTRICT READING, AND STATE READING COMPARISONS)
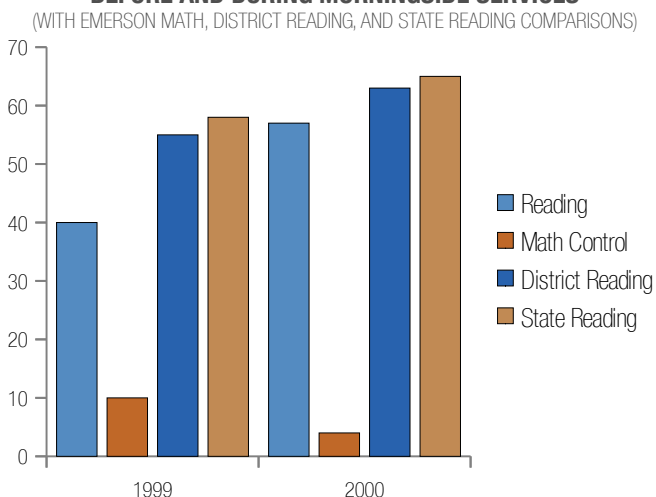


*Figure 7.* Improvements in reading scores on the Washington Assessment of Student Learning (WASL) following a Morningside implementation at Emerson Elementary School in Seattle, WA.

**HIGHLAND PARK WASL READING ACHIEVEMENT BEFORE AND DURING MORNINGSIDE SERVICES**
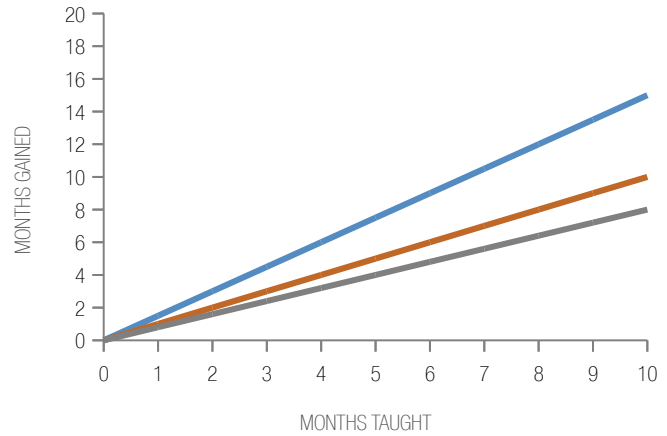(WITH HP MATH, DISTRICT READING, AND STATE READING COMPARISONS)
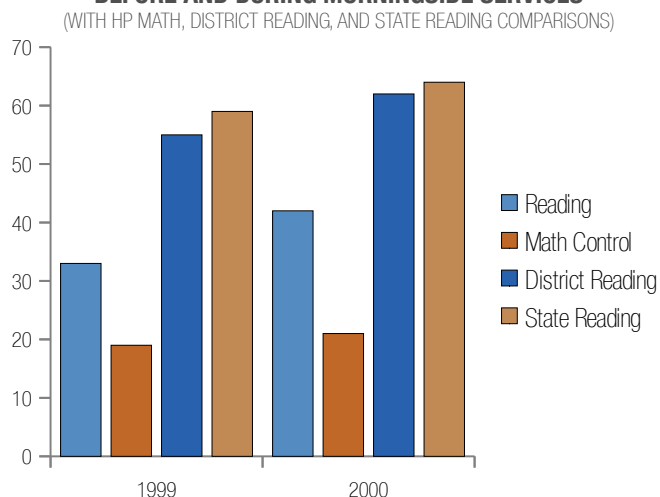


*Figure 8.* Improvements in reading scores on the Washington Assessment of Student Learning (WASL) following a Morningside implementation at Highland Park Elementary School in Seattle, WA.

READING MONTHS GAINED VS. MONTHS TAUGHT FOR STUDENTS FROM
**HEARST ELEMENTARY**
PARTICIPATING IN 1996–1997 MXC/MORNINGSIDE FIRST YEAR



READING MONTHS GAINED VS. MONTHS TAUGHT FOR STUDENTS FROM
**MCKAY SCHOOL**
PARTICIPATING IN 1996–1997 MXC/MORNINGSIDE FIRST YEAR
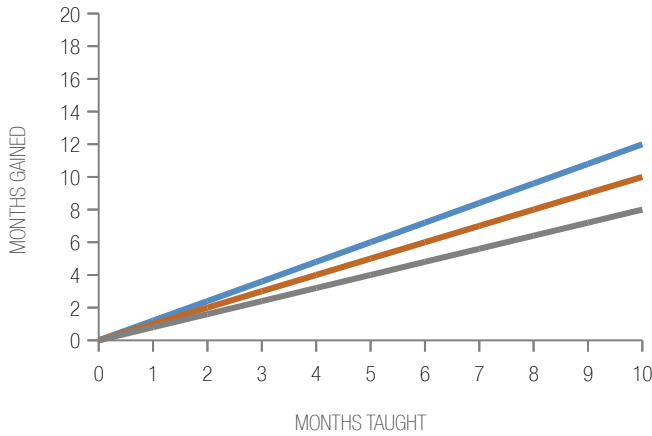


*Figure 9.* Improvements in reading on the Iowa Test of Basic Skills following a Morningside implementation at Hearst Elementary School in Chicago, IL. The gray line shows historic growth per year for students enrolled at the school; the orange line shows what growth would look like if students were growing a year for every year in school; and the blue line shows their actual growth following the Morningside implementation.
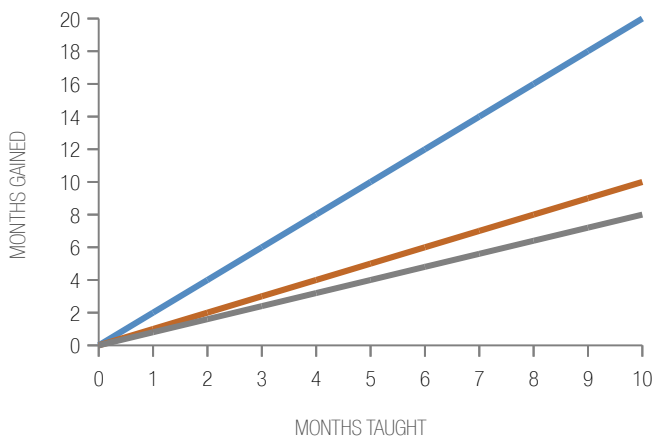
*Figure 10.* Improvements in reading on the Iowa Test of Basic Skills following a Morningside implementation at McKay Elementary School in Chicago, IL. The gray line shows historic growth per year for students enrolled at the school; the orange line shows what growth would look like if students were growing a year for every year in school; and the blue line shows their actual growth following the Morningside implementation.

sion on the ITBS in each grade in two of the MTA/Chicago partnerships. The first bar for each grade presents the mean percentage of students who were at or above the 50th percentile for a seven-year period (1990-1996) prior to implementing MTA reading programs. The second and third bars represent the mean percentage of students who were at or above the 50th percentile after one and two years of MTA respectively. These data reveal that students at each grade level performed significantly better in the two years of the MTA implementation than in the previous seven years.

More recent implementations have also produced impressive results. In 2001, MTA entered into a now 11-year relationship

READING MONTHS GAINED VS. MONTHS TAUGHT FOR 8TH GRADE STUDENTS FROM
**HERZL SCHOOL**



*Figure 11.* Improvements in reading on the Iowa Test of Basic Skills following a Morningside implementation at Herzl Elementary School in Chicago, IL. The gray line shows historic growth per year for students enrolled at the school; the orange line shows what growth would look like if students were growing a year for every year in school; and the blue line shows their actual growth following the Morningside implementation.

with Pine Ridge Indian School on the Pine Ridge Reservation in South Dakota. The goal was to improve reading scores. Figure 13 shows improvements in reading on the Stanford Achievement Test 9 following only four months of a Morningside implementation. The same students whose percentile scores in kindergarten were at the 27th percentile improved to 41st percentile one year later. The primary curriculum for these first grade students was Sprick, Howard, and Fidanque's (1998) *Read Well*. Students in second and sixth grades also made impressive gains after four months of Morningside technologies imbedded into the *Scott Foresman Reading (2000)* curriculum.

After a five-year stint in which Morningside Teachers' Academy (MTA) provided consultation, staff training, and teacher coaching to improve reading skills and strategies and reading test performance of students at Riverside Indian School (RIS), the second-largest off-reservation Bureau of Indian Affairs board school in the United States, students achieved federally specified levels of "annual yearly progress" (AYP) through their performance on tests of reading independently administered by the State of Oklahoma. This was the first time the school had achieved expected AYP since the *No Child Left Behind* legislation had taken effect. Pleased with the outcome and believing they could maintain the MTA protocols and programs, RIS officials discontinued the project and did not take advantage of

Table 1. Gains in grade equivalent reading scores for students in three Chicago School District Schools from 1996-1998.

| | Historic gains for each 10 months of reading instruction | Gains with MTA for each 10 months of reading instruction |
|---|---|---|
| Hearst Elementary School | 8 | 12 |
| McKay Elementary School | 8 | 15 |
| Herzl Elementary School | 8 | 20 |

**ALL SCHOOLS READING COMPREHENSION**
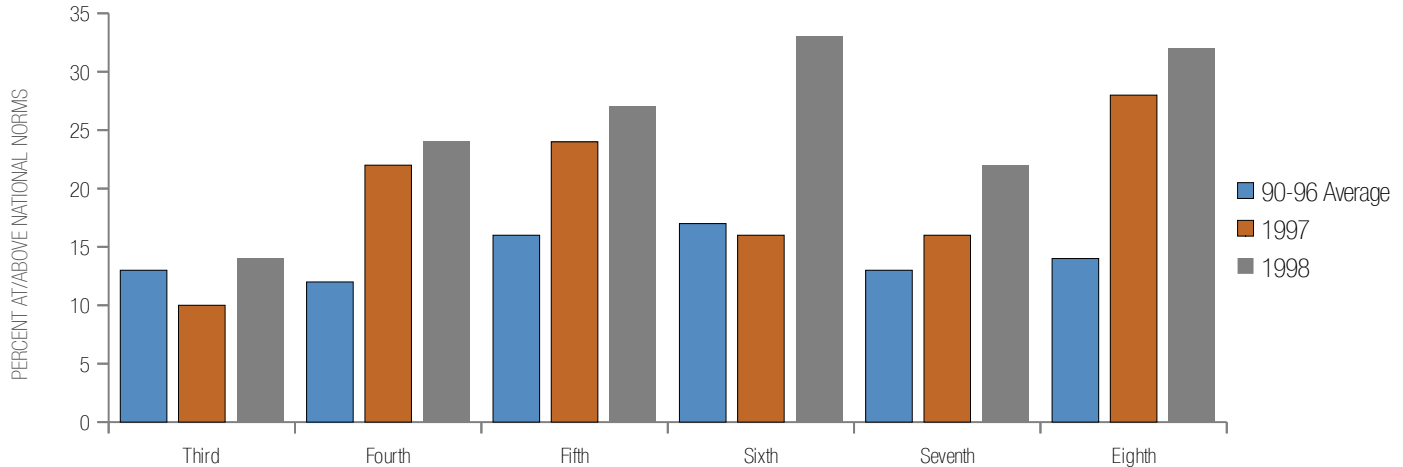PERCENT AT/ABOVE NATIONAL NORMS BY GRADE



*Figure 12.* Improvements in reading comprehension on the Iowa Test of Basic Skills across all 17 Chicago public schools that implemented the Morningside model.

our offer to select one or more on-site peer coaches and train them. Subsequently, program implementation drifted and some programs that had been instrumental to student success were dropped, either officially or by individual teachers. In late 2009, following a year in which test scores did not meet AYP, MTA was once again invited to partner with RIS to provide a booster shot for teachers who had been previously trained, to provide training for new teachers, to emphasize reading comprehension, and to ultimately establish a school-based coaching model that would ensure continued implementation when MTA consultants, trainers, and coaches were no longer on site. Because of the late date of finalizing the contract, training did not begin in earnest until February 2010. Thus, the 2009-2010 performance gains reflect the impact of approximately 3.5 months or slightly less than half a year of program implementation. In addition, because teachers were instructing an unfamiliar program, progress through the lessons was slow and students had barely scratched the surface of the program's potential by the time the posttest was administered. Even so, results were encouraging for

**PINE RIDGE INDIAN SCHOOL**
AVERAGE NATIONAL PERCENTILE RANK IN READING ACHIEVEMENT, SAT-9. STUDENTS' CURRENT PERFORMANCE WITH MORNINGSIDE READING FOR 4 MONTHS COMPARED WITH THEIR PERFORMANCE IN THE PREVIOUS GRADE BEFORE MORNINGSIDE.
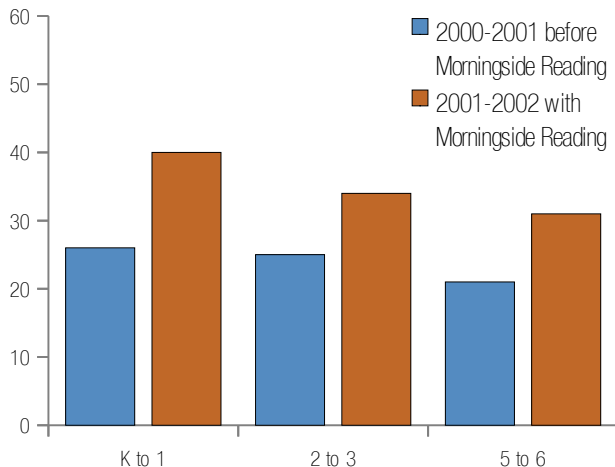


*Figure 13.* Improvements on the 2002 Stanford Achievement Test 9 following a Morningside implementation at Pine Ridge Indian School in South Dakota.

the four grade levels in which the program was implemented. Table 2 lists average pre- and post-test scores and average gains by grade level and percentile for students in grades 5 – 8 on the ITBS reading comprehension subtest. Figure 14 presents a graphic representation of the grade equivalent score data. In all cases, students gained more than half a year on pre- to post-test performance, gains that are particularly impressive when compared to their historical progress. Figure 15 provides a picture of the improved performance trajectory in reading comprehension for sixth grade students in Dixon's (2008) *Reading Success: Level A* program compared to their historical trajectories and to expected annual growth of one grade per year.

One-tailed *t*-tests revealed that differences from pre- to post-test scores were significant for grade 6 ($p = .0015$), grade 7 ($p = .019$), grade 8 ($p = .027$), and for all students combined ($p = .0001$). Although the fifth grade students' scores are included in the totals, an individual test for that grade was not performed because of the small *n*. The evidence suggests that the array of programs implemented by MTA substantially improved the reading comprehension of students as measured by the ITBS reading comprehension subtest.

## ■ FROM THE FIELD TO THE RESEARCH LABORATORY—A CALL FOR EMPIRICAL RESEARCH

Morningside Academy is a laboratory school in which scientifically validated curricular, management, and instructional elements are combined and recombined to produce anticipated student gains on specified outcomes. Through Morningside Teachers' Academy, we have extended the reach of these elements to the benefit of children and adolescents from diverse backgrounds who have struggled academically. We employ a changing criterion design and chart data on Standard Celeration Charts. The result is a mountain of evidence that students are learning and they are doing so faster than they were before they entered our laboratory school or one of our partner schools or agencies. As a field-based laboratory school, we rarely do bench science; that is, we rarely test individual elements of our curricular and instructional protocols to determine their rela-
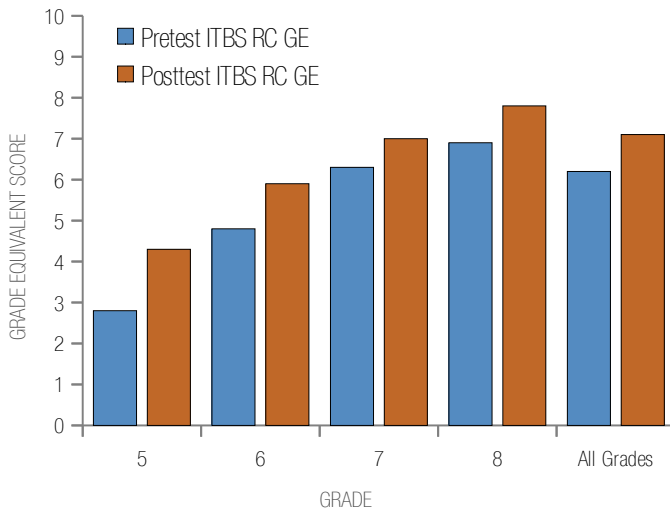
*Figure 14.* 2009-2010 Improvements in grade equivalent scores on the ITBS reading comprehension subtest for students in grades 5 – 8 at Riverside Indian School in Anadarko, OK for the 2009-2010 school year.

tive contributions toward our overall success. We don't systematically vary procedures in a rigorous experimental design.

This approach is consistent with the perspective forwarded by Johnston (1996) in his article in *The Behavior Analyst* titled "Distinguishing Between Applied Research and Practice." Johnston outlines three different levels of research appropriate for each of three levels of scientifically-driven organizations. According to his approach, organizations in the first level devote their efforts to basic human research in socially important areas and are found mostly in university settings. This research produces empirically verified techniques that may be applicable in a variety of situations and develops programs and "packages" that may be useful across the span of human service. Organizations in the second level are research communities that conduct experimentally controlled studies in applied settings. They are often part of a college or university or university-affiliated facility. Much of the research described in the *Journal of Applied Behavior Analysis* is produced by level two organizations. Sometimes level two research is not immediately applicable; rather it requires translational research (Mace & Critchfield, 2010) to discover and verify optimum application in level three settings.

Morningside Academy, as a service-oriented facility, illustrates the third level. Level three organizations provide an important service. They apply scientific research findings and they expose flaws in procedural explanations. While they engage in macro-level assessment to demonstrate the effectiveness of their

work, the work is often homogenized from several studies. The primary directive of most level three service-oriented facilities is to do what it takes to achieve the outcomes they promise. Rarely do they conduct experimentally controlled studies. As a third level scientifically driven facility, Morningside Academy packages together empirically supported curricula and instructional strategies to the benefit of our clients. We proceduralize curriculum in the laboratory school to make it more teacher- or student-friendly. We find ways to integrate several effective strategies into a workable set of routines for teachers. As we do this work, we feel we are recapturing the original intent of laboratory schools (Dewey, 1990a, 1990b): to test research findings through application in a complex environment on the one hand, and to pose interesting questions on the other hand. This interplay between field-based settings and the research laboratory ensures that basic research is helping to achieve solutions to authentic problems and that application is grounded in scientific study.

That said, sometimes Morningside faculty members become interested in a question and conduct informal research in their classrooms to tease out an answer. One of our master teachers, Marianne Delgado, developed just such a curiosity about the relative impact on memory of vocabulary words presented using a flash card approach as compared to an approach recommended by Isabel Beck and her colleagues (Beck, McKeown, & Kucan, 2002). In her classroom, she divided a group of what Beck calls "Tier 2" words—high frequency words found across a variety of domains that are appropriate for mature language users—into two sets. In an alternating treatment design, students either were given definitions and applied a typical flash card strategy or they developed richer understanding of the words using four strategies Beck, et al. recommend: Identifying the word's definition from context clues, determining if the word carried a positive or negative connotation; generating multiple forms of the word; and generating original sentences using the word. More than six months later, Delgado administered a vocabulary retention test and found that students could accurately define many more words they learned through the expanded approach than by memorizing definitions on flash cards.

Even so, it is rare that Morningside teachers can carry out well-designed research that could withstand the scrutiny of the scientific community. That's why we have, in a number of venues, encouraged research-sophisticated colleagues to undertake some of the interesting questions that emerge from our work. There are many areas in which additional research could benefit our enterprise. The behavior analysis community has ques-

Table 2. Average pretest and posttest *ITBS Reading Comprehension Subtest* grade equivalent and percentile scores for students in grades 5 – 8 at Riverside Indian School participating in Dixon's *Reading Success.*

| Grade Level | Pretest Grade Equivalent | Posttest Grade Equivalent | Difference | Pretest Percentile | Posttest Percentile | Difference |
|---|---|---|---|---|---|---|
| 5 | 2.85 | 4.40 | 1.55 | 8.50 | 30.00 | 21.50 |
| 6 | 4.77 | 5.88 | 1.11 | 26.50 | 38.40 | 11.90 |
| 7 | 6.36 | 7.01 | .65 | 37.71 | 40.71 | 3.00 |
| 8 | 6.95 | 7.86 | .91 | 35.28 | 40.72 | 5.44 |
| All Grades | 6.21 | 7.10 | .89 | 33.43 | 39.89 | 6.46 |
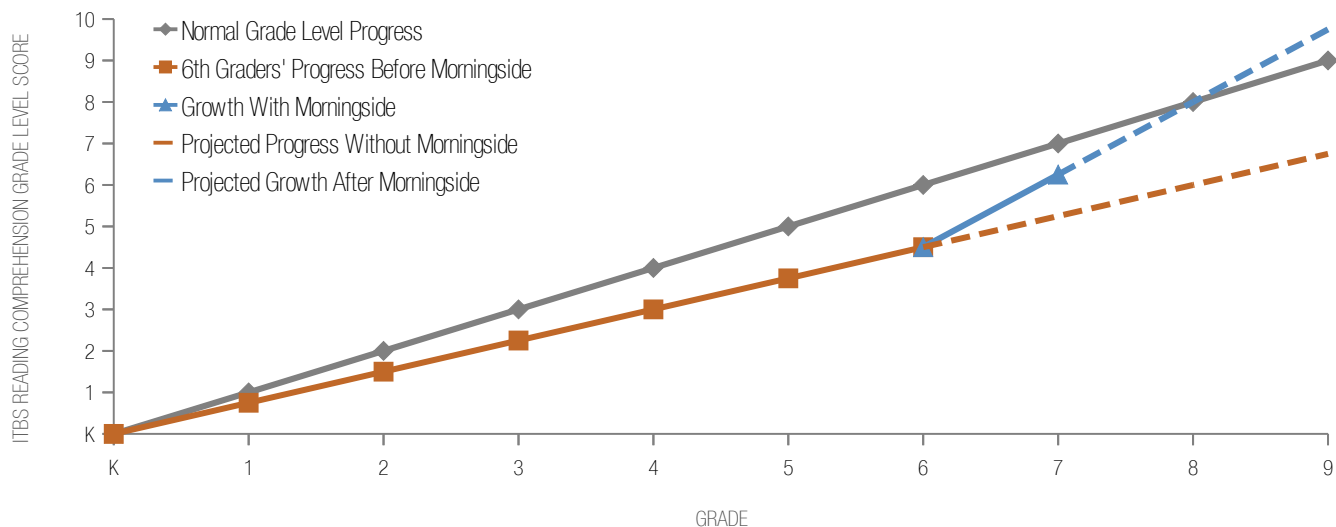
*Figure 15.* Improved performance trajectory in ITBS reading comprehension scores for sixth grade students at Riverside Indian School in Anadarko, OK participating in Dixon's *Reading Success: Level A* program compared to their historical trajectories and to expected annual growth of one grade per year. Scores are for 2009-2010.

tioned the research basis of Precision Teaching generally and fluency specifically. In the remainder of this article, we'll discuss the questions that have emerged.

Within the field of Precision Teaching, a number of practices have emerged that appear to improve students' performance in both the short and long term, but few if any have been empirically validated. Some scholars have challenged fluency proponents to provide better evidence that fluency-building or, more appropriately, frequency-building training—which is at the heart of Precision Teaching—is critical to the performance gains they report. For example, a recent article by Heinicke, Carr, LeBlanc, and Severtson (2010) summarizes concerns related to the use of fluency training in the behavioral treatment of autism. Despite our strong support of the Precision Teaching approach and considerable "soft" evidence of its effectiveness, we agree with Heinicke and colleagues that the field lacks adequate hard evidence of the benefits of frequency building and support both basic and applied research that would support or refute its importance.

In the basic research arena, we are encouraged by the work of Porritt, Van Wagner, and Poling (2009) who designed an animal analog to investigate with pigeons if "accuracy was higher under conditions that generated a higher rate of responding without altering the rate of reinforcement or number of trials arranged" (p. 297). Pigeons learned chains of pecking three response keys where the reinforced key sequence was contingent on the color of the illuminated keys. The number of trials, rate of reinforcement, task difficulty, and motivating operations were held constant, but the *rate* of responding was varied across three experimental conditions by imposing 5-s. delays between each stimulus presentation within a chain, 15-s. delays between chains, or no delays. Porritt, et al. found that accurate retention of previously-learned chains and accurate acquisition of new chains were significantly higher when there were no delays or delays between chains; that is, when the rate of responding within a chain was unimpeded. When delays were imposed within a chain, acquisition and retention were impaired. The

results support the beneficial effects of training to a fluency criterion.

In their study, Porritt, et al. (2009) identified and controlled for a number of potential confounds and set a path for continued basic animal research related to the efficacy of frequency building. We agree with the authors that a number of controls are necessary to empirically validate the relative effectiveness of frequency building. We described seven such conditions in our book *The Morningside Model of Generative Instruction: What it Means to Leave No Child Behind* (Johnson & Street, 2004b). We continue to assert their importance. They include:

- Equalizing trials between frequency-building approaches and other comparison groups;

- Beginning frequency-building procedures with performances that are firm at frequencies between 10 and 20 correct per minute with no errors;

- Ensuring that no feedback is provided during the timing period;

- Presenting stimuli in a free-operant approach that doesn't impose ceilings on performance;

- Protecting against ceiling effects by not requiring an observing response in all match-to-sample arrangements; and

- Conducting studies in advance of comparisons between fluency building and other comparison approaches to determine frequency aims necessary to get the MESAG (see below) and then set aims for all groups accordingly.

## FOUR AREAS FOR RESEARCH IN PRECISION TEACHING

We strongly support research that will provide the kind of basic science investigation that Porritt, et al. (2009) have launched and the kind of hard evidence that Heinicke, et al. (2010) have called for. We have identified four areas for research within Precision Teaching that we believe are critical to validating its value in the educational arena each of which is described below. They include the role of performance rate as an indicator of main-

tenance, endurance, stability, application, and generativity; the relative use of massed versus distributed practice and chunk size which we have labeled "frequency plus;" the value of setting performance aims; and the effects of goal setting on celeration. From these descriptions, we have teased out what we believe to be the ten most important research questions and include them in a "David Letterman Revisited" format at the end of this section.

*Performance rate as an indicator of MESAG: Maintenance, endurance, stability, application, and generativity.* From the outset, Morningside adopted Precision Teaching, an approach to practice that assumes that rate of responding is itself a critical predictor of fluency, to ensure student mastery of critical skills. In doing so, we agreed with arguments set forth by Ogden Lindsley (1991) and others that rate of responding or frequency adds power over accuracy of responding, and that number of trials alone does not predict fluency. Over the years, we've adopted several different acronyms for the attributes of fluent performance. It began with REAPS (retention, endurance, and application performance standards). Later evidence led us to include two additional attributes, and the acronym became RESAA (retention, endurance, stability, application, and adduction). More recently, we've reformed the acronym once again to make it more memorable; we now encourage teachers and students to "Get the MESsAGe!" (maintenance, endurance, stability, application, and generativity). These acronyms serve as a reminder that fluency describes performance that is easily maintained, endures over time, is stable in the face of distraction, is readily applied to "problems" similar to those which students have practiced, and is easily recruited to new problem solutions.

A number of behavior analysts and educational researchers have challenged Precision Teaching's assertions, citing insufficient evidence of its effectiveness. Precision Teachers and other rate-building enthusiasts counter that while there is no evidence, rate building is preferable because it is considerably more efficient than a slow trial-by-trial practice. However, opponents say the approach is unnecessarily stress-producing, and that the anxiety that results isn't worth the time savings.

In his extensive review of the literature on behavioral fluency, Binder (1996) describes over a dozen studies that have tested the degree to which frequency predicts maintenance, endurance, stability, application, and generativity. While these studies expand our understanding of this important question, as a group, they lack the kind of control that science requires. Many times the amount of practice is larger in the fluency condition, so one could say that amount of practice alone can produce maintenance, endurance, stability and application. Many times the amount of practice between fluency and control groups is equal but the average frequency of the control group's performance equals the fluency group, eliminating a basis of comparison. Some researchers have selected frequency aims that are considerably below levels predicted to produce the by-products of frequency. The bottom line: both basic and applied research that employs all appropriate controls is sorely needed.

*Frequency plus.* At Morningside, we have come under the control of a number of practices that surround frequency-building exercises. Some of these come from the behavioral literature; others come from the broader educational literature. Some are based on empirical evidence; some are simply described in the literature as best practices. These include:

- We make contexts for practice plentiful and varied, consistent with a general case analysis.

- We arrange for practice of "optimal size" chunks, usually small.

- We begin practice sessions with massed practice and continue massed practice until students reach a frequency criterion that predicts certain learning outcomes.

- We then provide additional, distributed practice, using practice materials that blend the newly learned material with other previously learned elements of the same type.

- When certain frequencies are reached, we shift to weekly and then monthly refresher practice.

Beginning with the assumption that behavioral fluency as defined by maintenance, endurance, stability, application, and generativity is an important outcome of education, the field of Precision Teaching would benefit from controlled studies to affirm or discredit the value of these practices. In addition, for those that prove useful, it would be helpful to have guidelines that suggest appropriate parameters for their use. For example, to what fluency levels should massed practice continue before moving to distributed practice?

*Setting aims.* Setting aims for individual instructional objectives is time-consuming. We support research similar to that of Fabrizio and Moors (2003) to set aims for learning channels, not instructional objectives. Learning channels, first described by Eric Haughton (1972, 1980), specify the "input" and "output" for an activity. For example, an action in which one sees a stimulus and says a response is called a "see/say" channel and is differentiated from those in which the student hears a stimulus and says a response (a "hear/say") or one in which the students hears a stimulus and writes a response (a "hear/write"). Fabrizio and Moors empirically tested their aims with children with autism working in an environment where learning channels and tasks show tight correspondence between the activity in the "input" and the activity in the "output." Johnson (2003) called for an expansion of their work to encompass all channels and to suggest aims for objectives in which the "input" and the "output" do not line up so tightly. Their channel-based approach to aim setting could produce a set of aims for a still finite set of learning channels that would serve the larger array of educational settings. He argues that levels of complexity of tasks within each channel might set the stage for a different aim and cites the following two "see/write" tasks to illustrate the point:

- In a "see/write" text objective, the learner *sees* a passage and *writes* or copies it.

- In "see/write" combined sentences, the learner *sees* a set of short, choppy sentences and *writes* a longer, complex sentence that incorporates the content from the short, choppy ones.

In the language of Precision Teaching, the observable stimulus conditions and the actions that define a target behavior and its frequency and celeration aims are called "pinpoints." John-

son notes that a review of the wider range of objectives typical of general education and business and industry pinpoints might lead to the discovery of several levels of learning channel aims and result in a channel-by-level (basic, intermediate, complex) aims matrix.

*Effect of goal setting on celeration.* In current practice, many teachers draw an anticipated celeration line on the daily Standard Celeration Chart to establish expected progress from baseline performance to an eventual performance aim. Daily goals are then derived from these celeration lines and are typically communicated to learners. For many years, celeration lines reflected an expectation that performance would grow 1.25 times (X1.25) per week. That is, if performance begins at 100 movements per minute, after one week of practice, one could reasonably expect performance at 125 movements per minute. As evidence mounted that student growth routinely exceeded the projected celeration line, Lindsley and others began to experiment with steeper celeration lines, X2 or X3 growth. Morningside Academy set a celeration aim of X2 for most of its pinpoints in the mid-1980s and redesigned instructional programs and protocols as necessary to produce these results. But even these celerations may underestimate potential growth. Further, conversations among Precision Teachers reveal differences of opinion. Some believe that communicating a daily performance aim to the learner results in speedier progress toward the eventual performance aim while others have suggested the practice may actually dampen growth. Both establishing more scientifically-derived celeration targets and determining the relative value of communicating daily performance aims present interesting questions for controlled empirical research: What are reasonable celeration targets and do they vary by learning channels or some other attribute of student learning objectives? In what ways does goal setting in Precision Teaching affect celeration?

### MORNINGSIDE'S TOP TEN FLUENCY RESEARCH QUESTIONS (DAVID LETTERMAN REVISITED.)

As we reported in Johnson and Street (2004b), our top ten fluency research questions line up like this:

10. What is the relation between different frequency aims and performance endurance?

9. What is the relation between frequency aims and remembering? Are there differences for different types of remembering (after Donahoe & Palmer, 1994)?

8. What is the relation between frequency aims and performance stability?

7. What is the relation between performance stability and endurance? Are they the same or different phenomena?

6. What is the relation between the frequency aims necessary for fluency, and celeration aims? Is it true that performances with steeper celeration slopes on Standard Celeration Charts will be fluent at lower frequency aims than performances that have more gradual celeration slopes? More generally, is it true that the faster one reaches the fluency aim, the lower the frequency aim one needs to reach?

5. What is the relation between error frequencies during performance establishment and the frequency aim needed for

fluency? Is it true that the fewer the errors produced during establishment, the lower one can set the frequency aim to produce fluency?

4. What is the relation between component and composite skill performance frequencies? Are they arithmetically, geometrically, or exponentially related? Do the relations change across the spectrum of frequencies?

3. What are effective peer frequency-building procedures to use in the classroom or work setting?

2. What are the most powerful arrangements of practice materials, specifically spaced and cumulative practice procedures? Is it true that one can set lower frequency aims with better spaced and cumulative practice materials?

1. What is the relation between frequency aims and contingency adduction? Do higher frequency performances squeeze out competing contingencies? Is it true that frequency building produces repertoires that require less instruction as one proceeds up a curriculum ladder or through a behavior sequence of increasing complexity? Under what conditions do frequency building and fluency procedures facilitate or inhibit creativity, problem solving, and expert performance? Will setting empirically derived fluency aims affect the amount or kind of deliberate practice (after Ericsson, Krampe, & Tesch-Romer, 1993) required to become an expert?

## ■ CONCLUSION

Morningside Academy has a long history of success operating as a third-level scientifically driven service organization (Johnston, 1996). In this capacity, our primary allegiance is to our customers and it is that allegiance that keeps us looking for, modifying, and proceduralizing curriculum, instructional practices, and assessment protocols. It is that allegiance that also makes us dependent on organizations in Johnston's first two levels to help us understand which of our complex package of strategies contribute to our success and how much each contributes. We believe, and our data support, that our current combinations of curriculum materials, instructional practices, and assessment protocols change the lives of our students, both in the laboratory school and in the public schools with which we partner. In fact, the partnered schools produce growth despite less-than-perfect procedural integrity, half-year implementations, and challenging school environments. Even so, we believe greater gains are possible. Because our goal is to help students catch up and move ahead, we are eager to streamline curriculum and instructional practices to achieve greater efficiency. We have been open to practices that have arisen from a variety of philosophic orientations and will continue to be, so long as evidence suggests their effectiveness and they protect the dignity of our students. As a scientifically driven service organization, we will never do bench science, but we stand ready to apply best practices as they emerge.

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