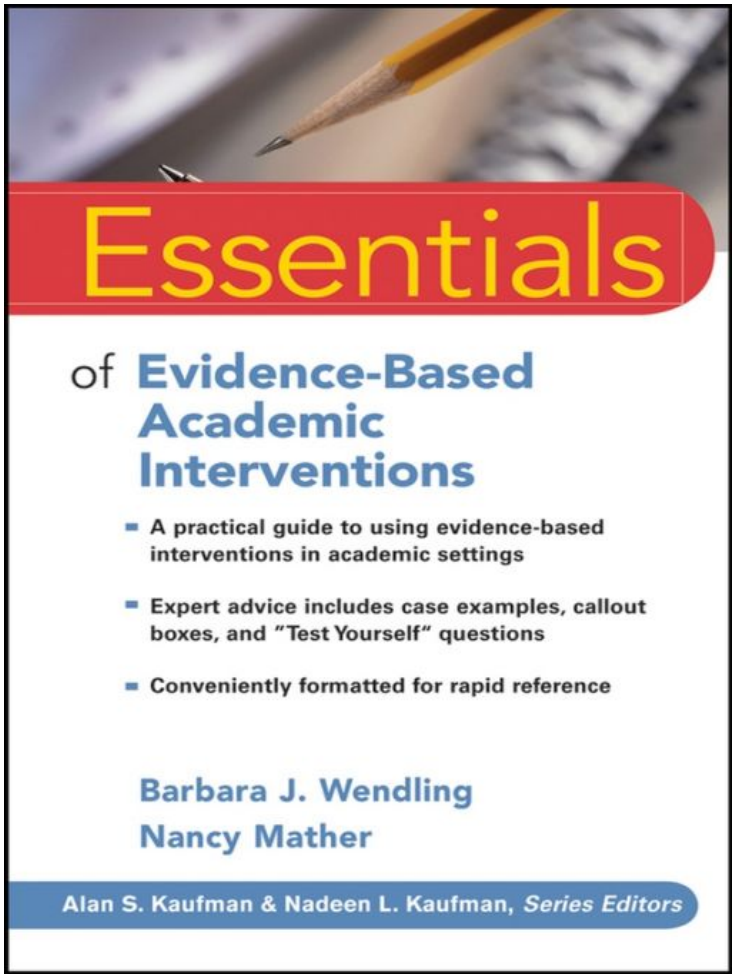
Essentials

of Evidence-Based Academic Interventions

- A practical guide to using evidence-based interventions in academic settings
- Expert advice includes case examples, callout boxes, and "Test Yourself" questions
- Conveniently formatted for rapid reference

Barbara J. Wendling
Nancy Mather

Alan S. Kaufman & Nadeen L. Kaufman, *Series Editors*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To Steve, my loving gentle bear, my angel here on earth.—Barbara

To Michael,—to past years and future years of love, laughter, and wildflowers . . .—Nancy

SERIES PREFACE

In the Essentials of Psychological Assessment series, we have attempted

to provide the reader with books that will deliver key practical information in the most efficient and accessible style. The series features instruments in a variety of domains, such as cognition, personality, education, and neuropsychology. For the experienced clinician, books in the series will offer a concise yet thorough way to master utilization of the continuously evolving supply of new and revised instruments, as well as a convenient method for keeping up-to-date on the tried-and-true measures. The novice will find here a prioritized assembly of all the information and techniques that must be at one's fingertips to begin the complicated process of individual psychological diagnosis.

Wherever feasible, visual shortcuts to highlight key points are utilized alongside systematic, step-by-step guidelines. Chapters are focused and succinct. Topics are targeted for an easy understanding of the essentials of administration, scoring, interpretation, and clinical application. Theory and research are continually woven into the fabric of each book, but always to enhance clinical inference, never to sidetrack or overwhelm. We have long been advocates of what has been called *intelligent testing*—the notion that a profile of test scores is meaningless unless it is brought to life by the clinical observations and astute detective work of knowledgeable examiners. Test profiles must be used to make a difference in the child's or adult's life, or why bother to test? We want this series to help our readers become the best intelligent testers they can be.

The *Essentials of Evidence-Based Academic Interventions* is designed for assessment professionals and educators alike who are looking for a resource on effective instruction. With the focus on response-to-intervention and evidence-based instruction in both general and special education we felt it important to add a book to our *Essentials* series that deals with effective instruction and intervention. The authors of *Essentials of Evidence-Based Academic Interventions,* Barbara Wendling and Nancy Mather, are both worldwide experts in academic interventions. They have created a convenient resource that identifies effective instructional techniques and materials for the achievement domains of reading, writing, and mathematics, as well as the general principles of effective instruction and the relevance of cognitive abilities to academic interventions.

Each chapter provides an overview of the academic area and the relevant research, the characteristics of individuals struggling with each academic area, and the ways to implement specific instructional interventions. In addition, the text contains helpful web sites and examples of effective commercially available programs. This book makes the essentials of evidence-based instruction accessible to all assessment professionals and teachers.

Alan S. Kaufman, PhD, and Nadeen L. Kaufman, EdD, Series Editors Yale University School of Medicine

One

GENERAL PRINCIPLES OF EVIDENCE-BASED INSTRUCTION

THE ROLE OF ASSESSMENT

> The single most important factor in planning for a child with a learning disability is an intensive diagnostic study. Without a comprehensive evaluation of his deficits and assets, the educational program may be too general, or even inappropriate.
>
> *—Johnson & Myklebust, 1967*

Results from comprehensive evaluations often reveal the various cognitive and linguistic factors that are affecting learning. With this information, evaluators are better equipped to use assessment results to help plan instruction. Understanding individual differences in attention, learning abilities, and memory is not only critical for informing instruction, but also for identifying individuals with specific learning disabilities. There is much debate about the need for comprehensive evaluation as part of the identification process for specific learning disabilities. Some argue that comprehensive evaluation is absolutely necessary, while others argue it is absolutely unnecessary. Some even make the case that the category of specific learning disabilities should be eliminated completely. Although confusion exists, Scruggs and Mastropieri (2002) advised that eliminating the construct of specific learning disabilities is like “throwing the baby out with the bathwater” (p. 165). A comprehensive evaluation is important to understanding an individual’s

strengths and weaknesses—a critical element not only for identifying specific learning disabilities but also for planning effective instruction.

Once the factors that are affecting learning and performance have been determined, both standardized and informal assessment results can help inform and improve instruction in several ways. First, assessment results can promote student learning. Teachers can ensure that students receive instruction at an appropriate level of difficulty with effective methods and materials. Learning is made accessible to students and teachers by knowing what skills and knowledge students have and have not mastered. Findings from the National Reading Panel (2000) indicate that teachers need to be able to assess individual students and then tailor instruction to their individual needs. This information helps the teacher focus on the specific instructional needs of each student. Assessment helps ensure that students receive targeted, carefully designed instruction rather than a one-size-fits-all approach.

Second, more frequent assessments, such as curriculum-based measures, can help students monitor their own learning—an important metacognitive goal. Students will know more clearly what is expected of them because they receive feedback on the criteria that need to be mastered. Third, assessment can document what students are able to do with information that is taught to them. Assessment is a powerful tool for improving teaching by revealing when instruction is working and when it is not. If students are not succeeding, instruction can be redirected, modified, or intensified as needed. Thus, assessment is viewed as a method or diagnostic process that helps determine the factors affecting learning, reveals the present levels of performance, helps establish the goals of intervention, and helps evaluators determine the most effective instructional methods.

The implementation of effective instruction is critical for both general and special education. Under No Child Left Behind (NCLB, 2001), educators must consider results of scientifically based research, if available, before making instructional decisions. In the Individuals with Disabilities Education Improvement Act (IDEA, 2004), response to intervention (using scientifically based instruction) is specified as a process to help reduce instructional casualties and identify students with specific learning disabilities. These mandates have placed a focus on the importance of using evidence-based instruction in both general and special education classrooms. Therefore, knowledge of what constitutes evidence-based instruction is essential for all educators and evaluators.

WHAT IS EVIDENCE-BASED INSTRUCTION?

Evidence-based instruction has been defined as "the integration of professional wisdom with the best available empirical evidence in making decisions about how to deliver instruction" (Whitehurst, 2002, slide 2). At its core, evidence-based instruction simply means that the program, methodology, and/or practice have records of success. In other words, reliable and valid evidence indicates that intervention works. Most educators agree that evidence of effectiveness should be objective, valid, reliable, systematic, and refereed. The No Child Left Behind Act of 2001 states that *scientifically based research* means research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to educational activities and programs. However, the integration of practitioner expertise with the best available research evidence is the practical application of evidence-based instruction. The practitioner is ultimately responsible for determining whether or not the specific

instruction or intervention is producing the desired results (Frederickson, 2002).

The search for effective programs is not new. In the mid-1960s, the First Grade Studies were completed (Bond & Dykstra, 1967). These were a federally funded collection of 27 studies on reading instruction. The conclusion from this project was that no single approach or method was distinctly better in all situations than the others. More recently, the National Clearinghouse for Comprehensive School Reform (2001) concluded that ". . . no models had uniformly positive effects, and no models had uniformly negative or neutral effects. In other words, no model worked in every case and every situation" (p. 21). These findings are similar to the earlier conclusions of Monroe (1932), who found that one method did not work with all children: Different reading methodologies were needed for the different cases.

DON'T FORGET

Although they have different definitions, the terms evidence-based, research-based, or scientifically based are often used interchangeably.

The International Reading Association (2002) recommends that teachers and administrators ask certain questions when reviewing materials. While the questions apply to selecting reading materials, the first two questions clearly provide guidance regarding how to select and implement evidence-based instruction irrespective of academic domain.

1. Does this program or instructional approach provide systematic and explicit instruction in the particular strategies that have been proven to relate to high rates of achievement in reading for the children I teach?

CAUTION

Just because a program or practice is described as evidence-based, it does not ensure that it will work with all learners. Educators must still determine if the materials or instructional methods are a good match for each student.

2. Does the program or instructional approach provide flexibility for use with the range of learners in the various classrooms where it will be used? Are there assessment tools that assist teachers in identifying individual learning needs? Are there a variety of strategies and activities that are consistent with diverse learning needs?
3. Does the program or instructional approach provide a collection of high-quality literary materials that are diverse in level of difficulty, genre, topic, and cultural representation to meet the individual needs and interests of the children with whom it will be used?

With legal mandates to use evidence-based instruction, there is an increasing need to evaluate programs, products, practices, and policies to determine if reliable and valid evidence supports their efficacy. To address the need for information on effective practices, the United States Department of Education's Institute for Education Sciences established the What Works Clearinghouse website (www.ies.ed.gov/ncee/wwc/) to provide a central, independent, and trusted source of scientific evidence of what works in the field of education. Selected evidence-based programs, products, practices, and policies can be found in the current text in the chapters related to each academic area.

DON'T FORGET

Information regarding evidence-based instruction can be found at the What Works Clearinghouse website

(www.ies.ed.gov/ncee/wwc/).

WHAT WORKS? EVIDENCE-BASED PRACTICES

The central goal of this book is to make the essentials of evidence-based instruction easily accessible. While research has not identified one *best* program or model of instruction that works for all students, examinations of best practices have led to highly consistent results. Many teachers are already incorporating research-based practices into their teaching and clearly these effective teachers do make a difference.

Teacher Effect

Teachers have a powerful influence on learners (Bond & Dykstra, 1967, 1997). In fact, knowledgeable teachers are the key to successful classrooms (Invernizzi & Hayes, 2004). Highly effective teachers incorporate certain instructional principles in their classrooms that enhance student learning. A number of instructional practices should be part of the instructional program in every classroom from primary level to graduate school. Rapid Reference 1.1 presents ten effective teaching principles suggested by Ellis, Worthington, and Larkin (1994). Effective teachers incorporate all of these principles into their planning and lesson design.

Both researchers and effective teachers have known for a long time that students' responses to instruction are indicators of the quality of the instruction they are receiving. Three variables relate to the quality of instruction: the amount of time on task; the student's level of success; and the content covered (Archer & Issacson, 1989). Effective teachers manage instruction in such a way that the students

spend the majority of instructional time actively engaged in learning, working with high levels of success, and progressing through the curriculum. The following key principles of effective teaching are applicable to all achievement domains.

Prior Knowledge

The ease of new learning is influenced by the learner's existing knowledge. By activating prior knowledge, teachers help students become ready to assimilate new information. This cueing helps the learner associate new information with previously learned knowledge, thereby improving the chances of a successful learning experience and retention.

More is known about the science of learning and how our brains work than ever before. The human brain seeks to construct meaning by connecting new information and concepts to information already present in the neural network. Information about a certain concept—the essential unit of human thought—is usually stored in various parts of the brain rather than in just one location. Concepts that do not have multiple links with how an individual thinks about the world are not likely to be remembered or useful. For example, in learning the concept of *tiger,* the color of the tiger may be stored in one part of the brain, the sound the tiger makes in a different location, and the semantic category of animal in yet another. These multiple links make the information more useful and memorable because thinking about *tiger* causes numerous neurons to fire together. The more neurons fire together, the more they wire together (Hebb, 1949), thereby improving the process of storing and retrieving information.

Rapid Reference 1.1

Ten Effective Teaching Principles

1. Active engagement. Students learn more when they are actively engaged in an instructional task.
2. Build-in success. High and moderate success rates are correlated positively with student learning outcomes, whereas low success rates are correlated negatively with outcomes.
3. Opportunity to learn. Increased opportunity to learn content is correlated positively with increased student learning achievement; therefore, the more content covered, the greater the potential for learning.
4. Direct instruction. Students achieve more in classes in which they spend much of their time being directly taught or supervised by their teacher.
5. Scaffold instruction. Students can become independent, self-regulated learners through instruction that is deliberately and carefully scaffolded. (See page 9 for more information on scaffolding instruction.)
6. Address forms of knowledge. The critical forms of knowledge associated with strategic learning are: (a) declarative knowledge (i.e., knowing facts), (b) procedural knowledge (i.e., knowing how to use the knowledge in specific ways), and (c) conditional knowledge (i.e., knowing when and where to apply the knowledge). Each of these must be addressed if students are to become independent, self-regulated learners.
7. Organizing and activating knowledge. Learning is increased when teaching is presented in a manner that assists students in organizing, storing, and retrieving knowledge.

8. Teach strategically. Students can become more independent, self-regulated learners through strategic instruction.
9. Explicit instruction. Students can become independent, self-regulated learners through explicit instruction.
10. Teach sameness. By teaching students how things are alike both within and across subjects, teachers promote the ability of students to link new information to previously learned concepts (i.e., generalize and transfer knowledge).

Active Engagement

Another key predictor of academic success is the amount of time the student is actively engaged in learning (Greenwood, Horton, & Utley, 2002). When the student is an active participant, he or she is thinking about the task, increasing attention and focus. Numerous ways exist to engage the learner actively, including: discovery-based learning, peer tutoring, reciprocal teaching, writing, and cooperative learning. Ensuring that the student is an active, not passive participant means that the student is doing the *work* of learning. Meaningful involvement aids learning and retention.

Young children can learn most readily when things are concrete and directly accessible to their senses. Hands-on learning activities that incorporate tangible objects that are explored through sight, sound, smell, movement, or touch actively engage the learner. All learners, irrespective of age, can benefit from concrete examples and illustrations when learning something new.

Explicit Instruction

Nothing is left to chance with explicit instruction. The task is clearly explained, modeled or demonstrated by the teacher, practiced by the learner with frequent feedback, and then practiced independently. With explicit instruction, the student knows exactly what to do—it has been explained, demonstrated, and practiced with guidance to ensure that the skill is being mastered.

Scaffolding Instruction

Scaffolding instruction is another important element of effective teaching because it provides a bridge between what the student knows and what the student is learning. When explicit instruction is delivered as intended, the teacher uses scaffolding. In the first stage, the teacher assumes most of the responsibility for the learning process by modeling or demonstrating the task. In the next stage—guided practice—the student and teacher share responsibility for completing the task. The student practices the skill and the teacher provides assistance and feedback, thus supporting the student's learning during this stage. In the final stage—independent practice—the student has responsibility for the task. Scaffolding and explicit instruction both provide feedback and guidance to ensure success.

Differentiated Instruction

Differentiated instruction, based on a compilation of theories and practices, provides a means for dealing with individual student differences within the same class. It provides multiple options and opportunities for students to learn the information. This form of instruction requires teacher flexibility in implementing an instructional approach that recognizes that one size *does not* fit all. Three elements

of instruction can be differentiated: the content (what is to be learned), the process (how it is to be learned), and the product (the way mastery is demonstrated). The focus of differentiating instruction is the *how* to teach, but the how is highly dependent upon knowledge of each student, development of a learning environment that works for each student, and the design of an appropriate curriculum (Tomlinson, 2006).

DON'T FORGET

Systematic, explicit instruction does not mean that everyone is on the same page at the same time in the same workbook (Invernizzi & Hayes, 2004). Explicit instruction provides differentiated instruction to individual learners.

Although many aspects of differentiated instruction have evidence of effectiveness as a whole, empirical evidence is lacking (Hall, 2002). Differentiated instruction does incorporate proven concepts such as readiness for a task, actively engaging learners, teaching at the student's level, and grouping students for instructional purposes. In addition, implementation of different technologies can increase the opportunities to differentiate instruction. Essentially, differentiated instruction is a way of thinking about teaching and acknowledging that students differ in their learning abilities, and that teachers must attempt to teach all students, as well as the content (Tomlinson, 2006).

Strategy Instruction

The use of strategies can also facilitate learning. Strategies are like game plans for successful learning. Some students use strategies automatically, whereas others need to be taught how, when, where, and why to use specific strategies. Different types of strategies are applicable in

different situations. Self-monitoring strategies have the students ask questions such as “Am I on task?” Metacognitive strategies encourage the use of questions such as “Do I understand the task?” In addition, task-specific strategies, such as using a first-letter mnemonic, can help with the recall of specific information. For example, HOMES is a mnemonic for recalling the names of the Great Lakes: *H*uron, *O*ntario, *M*ichigan, *E*rie, and *S*uperior.

The Center for Research and Learning at the University of Kansas is at the forefront of research in the development of evidence-based learning strategies for students with learning disabilities. Not only have they designed effective learning strategies to assist students with acquiring, retaining, and using knowledge, but they have also developed a Learning Strategies Curriculum. The focus of the curriculum is on direct, explicit instruction to help students become strategic learners.

DON’T FORGET

Self-questioning, the primary self-monitoring strategy, is a powerful and necessary technique for learning (Polloway & Patton, 1993).

Advance Organizers

Advance organizers are ways to cue the learner to the task at hand by providing an overview of the *big picture.* Advance organizers make use of prior knowledge and actively engage the learner. Teachers may use metaphors or analogies to help learners connect new information to existing knowledge. Other advance organizers include student- or teacher-generated questions and graphic organizers. The K-W-L procedure (Ogle, 1986) is easy to use as an advance organizer. Typically, students are provided with a graphic or they divide a paper into three columns and

write at the top of each: Know (K), Want to Know (W), and Learned (L). First, the students write what they already know about the topic in the first column (activating prior knowledge). Second, the students write what they would like to learn about the topic in the middle column (active engagement). After the lesson, the students write what they have learned in the third column (actively engaged in summarizing). A fourth column can be added to create the graphic K-W-L-Plus. In this last column, students can record additional information they still want to learn about the topic.

Higher-Order Thinking Skills

Another important teaching principle is to help students think deeply about the information and go beyond simple memorization of facts. Deep thinking, or elaboration, actively engages the learner in the task. Unfortunately, teaching frequently focuses on students acquiring knowledge through rote recall. Findings from research have indicated that teachers engage students in activities requiring higher-order thinking skills less than 1% of the time (Goodlad, 1984). If students are expected to think critically and apply skills to novel situations, they must be given many opportunities to engage in this type of thinking.

Feedback

Still another important principle for successful learning is the provision of immediate, corrective feedback (Marzano, Pickering, & Pollock, 2001; Mathes & Babyak, 2001). Learning is enhanced when the learner has the opportunity to express ideas and get immediate, frequent, and relevant feedback from teachers or peers. Feedback that is provided long after the learner completes the task (e.g., 2 weeks

later, at the end of the semester) is not beneficial. In addition, the learner needs the opportunity to reflect on the feedback, make adjustments, and then revise information or try the task again.

Expectations/Climate of Success

Success breeds more success. Learners who believe they can complete tasks make more progress than those who lack confidence in their capabilities. If faced with repeated failures, most students will give up. Because ineffective instruction often leads to student failure (Engelmann & Carnine, 1982; Kame'enui & Simmons, 1990), teachers must create successful learning opportunities for all students. Tasks need to be challenging but possible to complete. For optimum effectiveness, the student must experience a success rate of about 80 to 85% (Greenleaf, 2005; Tomlinson, 2000). This is why scaffolding instruction and effective teaching practices are so critical. They help build-in success for each student.

DON'T FORGET

For optimal effectiveness, the student must experience a success rate of about 80 to 85% on instructional tasks.

In addition, students are sensitive to the expectations of others. Both the positive and negative expectations of parents, teachers, peers, and even the media can affect students' expectations and thus their learning behaviors. Negative messages can create a loss of self-confidence and inhibit their performance. For example, it is commonly believed that girls do not do as well as boys in science and math. If this negative expectation is reinforced, it can decrease a girl's confidence in her ability to succeed in such courses of study or in a career related to math or science.

Peer-Mediated Instruction

Peer-mediated instruction is another powerful influence on academic motivation and achievement (Light & Littleton, 1999; Steinberg, Dornbusch, & Brown, 1992; Wentzel, 1999). This type of instruction can also help students develop social skills (Fuchs, Fuchs, Mathes, & Martinez, 2002; Miller & Miller, 1995; Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, 2003). Students that are taught how to work cooperatively make greater progress than those who are not given any instruction on how to work together (Fuchs et al., 1997). The two major forms of peer-mediated instruction are peer tutoring and cooperative learning.

Peer tutoring

Peer tutoring pairs up two students, of similar or dissimilar abilities, to practice skills that have been presented earlier. The students help each other or, in some cases, a higher achieving student helps and monitors the performance of a lower achieving student (Maheady, Sacca, & Harper, 1988). Cross-age tutoring, peer-assisted learning strategies (PALS) (Fuchs & Fuchs, 1995), and reciprocal peer tutoring (RPT) (Fantuzzo & Ginsburg-Block, 1998) are all examples of peer-tutoring strategies. Rapid Reference 1.2 provides tips for organizing a peer tutoring lesson.

Rapid Reference 1.2

Tips for Organizing a Peer-Tutoring Lesson

- Design lessons to reinforce skills already taught to students.
- Identify a specific learning objective to be presented by the tutor.
- Teach students how to be tutors.
- Provide a script of prompts for the tutor.

- Provide necessary flash cards or lists of skills to the tutors.
- Provide a daily log to record the results of the tutoring session.

Cooperative learning

Cooperative learning involves groups of students, usually three or more of differing ability levels. The students work in small, heterogeneous groups on tasks they are expected to help each other learn (Slavin, 1983). The best outcomes are associated with cooperative learning groups that require individual accountability in order to earn the group reward. One side benefit of cooperative learning groups is the increased social acceptance of low achievers by high achievers, resulting in higher levels of self-esteem for the low achievers (Madden & Slavin, 1983).

Rapid Reference 1.3

Nine Best Instructional Strategies

1. Identifying similarities and differences
2. Summarizing and note taking
3. Reinforcing effort and providing recognition
4. Providing appropriate homework and practice
5. Producing physical or mental images (nonlinguistic representations)
6. Having students engage in cooperative learning
7. Setting goals and providing feedback
8. Generating and testing hypotheses (apply knowledge to a new situation)
9. Providing activities to help students activate prior knowledge

Nine Best Instructional Strategies

Rapid Reference 1.3 presents the nine best instructional strategies identified by Marzano et al. (2001). The strategies are listed in descending order of effectiveness. All of the strategies require active involvement of the learner, which is one of the most effective, evidence-based teaching practices.

DON'T FORGET

Effective instructional practices are critical elements of lesson design and delivery.

CONCLUSION

Knowledge of what constitutes effective instruction is not new. For several decades, researchers and educators alike have known the principles of effective teaching as well as the characteristics of effective teachers. Research continues to affirm these effective techniques, methods, and characteristics, even as researchers seek to validate the effectiveness of specific curricula and materials. What is new is the legal requirement to use evidence-based instruction. Both NCLB and IDEA mandate that general and special educators use methods and materials that work and have a positive impact on student progress.

The reason for these laws stems from concern regarding the academic progress of students. Based on the results of the National Assessment of Educational Progress (2007), less than one third of fourth (31%) and eighth (29%) graders were proficient in reading. In math, 38% of fourth graders and 31% of eighth graders were at the proficient level. Sadly, almost equal percentages were found to be below the basic level in both reading and math. The hope is that the application of research to practice will result in significant improvements in student learning and achievement.