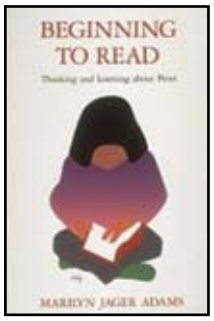
Research Foundation Paper

System 44

Dear Educators,



Writing the book *Beginning to Read: Thinking and Learning about Print* (1990) was one of the highlights of my professional life. Across disciplines, the research literature proved rich with information about the nature and challenges of early reading, and its collective message was one of great hope about the real prospect of opening the world of literacy to every child. Over the years since then, as scientifically based reading approaches have found their way into classrooms, reading achievement in the primary grades has improved substantially.

Nevertheless, reading growth has languished in the middle-grades and up, and there are still far too many students at these levels who struggle with the literacy skills and strategies needed to succeed in school and in life. It is therefore of great importance that research in the educational, cognitive, linguistic, and neurosciences areas has made much progress since 1990 toward understanding the needs of older students and how best to help them.

It was to assist in the interpretation and instructional translation of such research that Scholastic asked me to work with them. In accepting this invitation, I found myself joining an extraordinary group of authors and advisors, assembled by Scholastic with the goal that every key aspect of the program would receive expert and sensitive guidance. In complement, I have been continually impressed with the intelligence and tireless dedication with which our colleagues on the Scholastic staff, of every job description and level, have striven to meld the myriad recommendations and considerations into a classroom flow, at once faithful to the research yet manageable and understandable by teachers and students.

This document, *System 44 Research Foundations,* provides an overview of theory and empirical research from which *System 44* was built. The focus is on identifying and serving the individual instructional needs of every student so as to support each in acquiring, as quickly and powerfully as possible, the knowledge, strategies, and confidence for attaining level-appropriate reading and comprehension. While the research synthesis was undertaken as part of the design effort for *System 44*, I think you will equally appreciate it in itself—both as documentation of the depth and dimensionality of the literacy challenge and as substantive testament that this is, indeed, a challenge that education can, should, and will conquer.

Sincerely,

Dr. Marilyn Jager Adams

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Introduction

The word *hero* does not appear on the Dolce list of 1000 high-frequency words, but it has become much more pervasive in the media during the twenty-first century. Rarely mentioned, however, is the everyday heroism of the nation's educators. These heroes include teachers who spend their evenings and weekends working to meet the needs of their students; researchers who search diligently for ever more effective methods of teaching literacy to all students; and administrators from the local to the national level who try to create school systems that meet the needs of all students.

Despite the dedication and expertise of so many educational professionals, the statistics on reading proficiency in older readers clearly demonstrate that too many are failing to master the literacy skills they need for success in school and life. Examples include these findings from the National Assessment of Educational Progress (Grigg, Donahue, & Dion, 2005; Lee, Grigg, & Donahue, 2007):

- Thirty-four percent of fourth graders tested in 2007 performed at below basic levels.
- Twenty-seven percent of eighth graders tested in 2007 performed at below basic levels.
- Twenty-seven percent of twelfth graders tested in 2005 performed at below basic levels.
- These reading problems affected students in almost every social, cultural, and ethnic group.

Research suggests that many of these older struggling readers are students who lack foundational word reading skills. Recent studies of older struggling readers showed that more than 60% of the students performed at very low levels on basic word-reading skills (Hock, Deshler, Marquis, & Brasseur, 2005; Hock et al., in press; Leach, Scarborough, & Rescorla, 2003; Torgesen et al., 2007).

The nationwide literacy crisis has long been cause for concern, but never more so than at this time when "the demands for high levels of literacy are rapidly accelerating in our society" (Torgesen et al., 2001). According to the Rand study researchers (2002), "All high school graduates are facing an increased need for a high degree of literacy, including the capacity to comprehend complex texts, but comprehension outcomes are not improving."

The outlook is worse for students who do not graduate. Nationwide, about one in three high school students drops out before graduating, according to a 2008 report by America's Promise, and the percentages for urban schools are even higher. Only 52 percent of students in the principal school systems of the 50 largest cities complete high school with a diploma. In some urban school districts, fewer than 35 percent of students graduate with a diploma. According to a U.S. Department of Education press release (April 1, 2008), 90 percent of the jobs in the fastest-growing areas require education or training beyond high school.

A Breakthrough Foundational Reading Intervention

With the needs of older struggling readers and their teachers in mind, Scholastic has developed a breakthrough new system designed for students who have not yet mastered the most foundational reading skills. The result of collaboration between Dr. Marilyn Adams, author of the seminal work *Beginning to Read: Thinking and Learning About Print,* and Dr. Ted Hasselbring, the scientist behind the development of the FASTT model for learning through technology and of Scholastic's *READ 180* program, *System 44* combines the very best thinking on research-based phonics instruction for older students with the power of state-of-the-art adaptive technology and age-appropriate, supportive fiction and nonfiction text. Recognizing the importance of student engagement, *System 44* provides older, disenfranchised students with opportunities to be successful quickly, along with built-in motivation systems. *System 44* includes research-based features designed for our most challenged older readers:

- An efficient, reliable, and valid computer-based assessment called the *Scholastic Phonics Inventory* (SPI), which can be used for screening and placement purposes.
- Explicit instruction that covers the building blocks of the English language, including phonological and phonemic awareness, phonics, morphology, and orthography, and connects them to meaning.
- Software that provides the individualized, repeated practice that builds fluency and adapts automatically and continuously to data being captured by curriculum-embedded assessment, ensuring that every single student moves efficiently through the program.
- A comprehensive teaching system developed for teachers of older students that includes multiple strategies for instruction and grounds teachers' work in reliable research and best practices.
- A *Teaching Guide* that presents direct teaching, teacher modeling, guided and independent practice and application, as well as opportunities for preteaching and reteaching as needed for specific students. Best-practice structured engagement routines involve all students in concept-building, using academic language, and generating and sharing ideas.
- Varied reading opportunities, including decodable text, independent reading libraries, and scaffolded reading experiences on the computer.
- Age-appropriate, academically aligned nonfiction content and high-quality literature that spans multiple genres and connects to the content areas.
- Content and technology that engage students in their own learning, increase accountability, and reward sustained effort.

The Research Foundations

An extensive body of literature, both theoretical and empirically based, was reviewed to develop the research foundations for *System 44*. These research foundations can be organized into the areas described in Table 1.

Table 1. System 44 *Research Foundations*

Context for Instruction and Learning	Instructional Content	Cognitive Connections
• The Older Struggling Reader • The Teacher • Technology and Text	• Efficient Screening, Placement, and Progress-Monitoring Assessments • Phonemic Awareness • Phonics Foundations • Word Analysis (Syllabication & Morphology) • Spelling & Word Study • Sight Words • Vocabulary, Usage, and Meaning • Putting It All Together: Reading	• Principles of Cognition and Learning • Principles of Motivation and Engagement

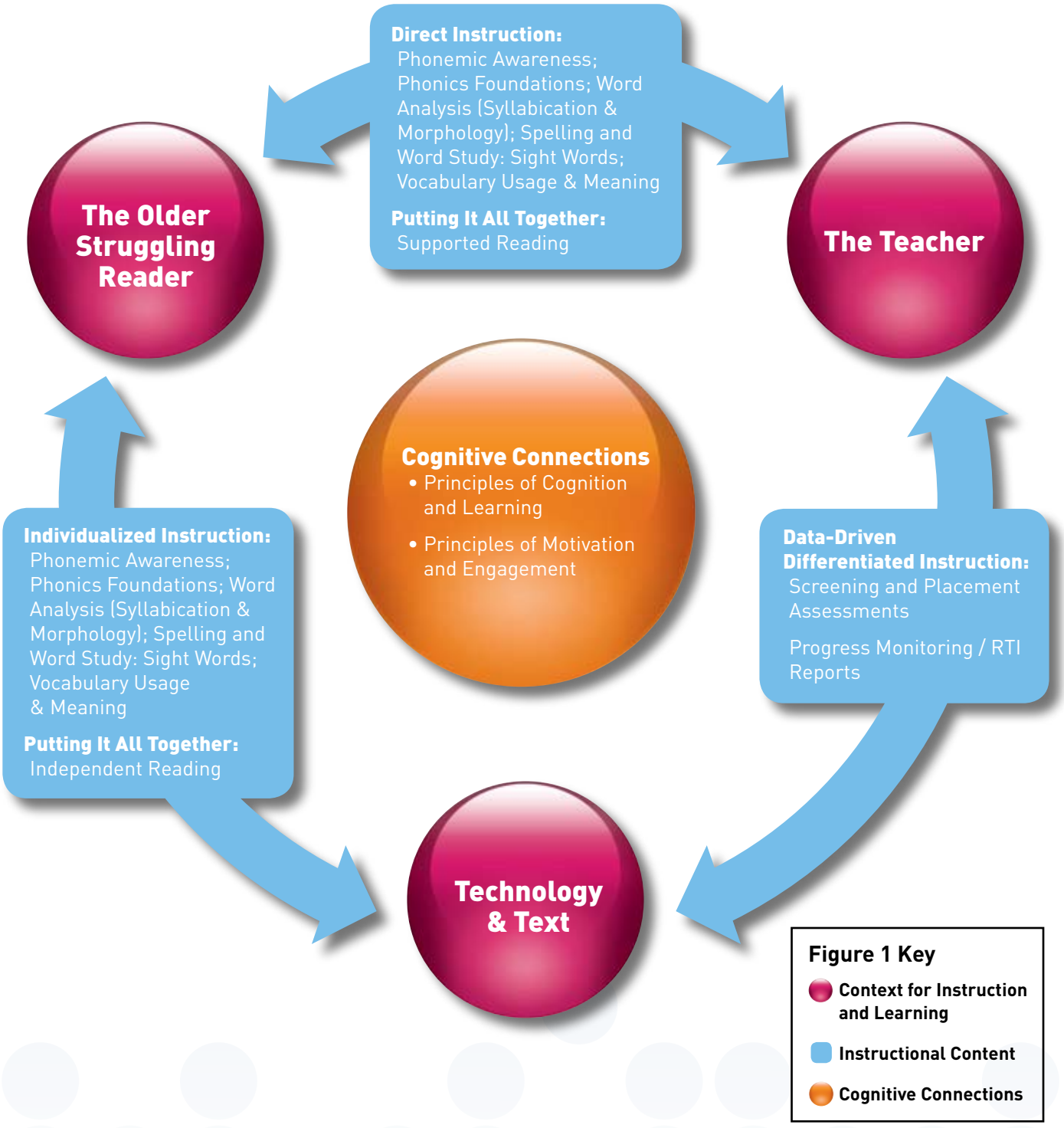
Figure 1 illustrates how these three areas fit together in *System 44*. As Figure 1 shows, the context for *System 44* instruction and learning is defined by three main actors: the older struggling reader, the teacher, and the technology/text. *System 44* has been carefully designed to support the teacher and the technology and text in responding to the particular instructional and developmental needs of the older struggling reader.

System 44 is brought to life when the student, teacher, technology, and text engage around the highly motivating, intensive instructional content. The teacher-led, technology, and print components of *System 44* guide the student through a systematic scope and sequence that builds mastery of letter sounds, sound-spelling correspondences, morphology, word strategies, sight words, vocabulary, fluency, and more.

The strength of this comprehensive intervention program lies in its deep grounding in research on cognition and learning, and on learning to read in particular. Brain research offers important insights into how individual neurological differences impact learning to read, as well as into how particular instructional strategies can help students build cognitive connections as they learn to read.

As Figure 1 illustrates, the context, content, and cognitive connections in *System 44* are integrated to form a comprehensive program that supports students in cracking the code and mastering the 44 sounds and 26 letters that make up the English language. The following sections of this paper discuss the context, content, and cognitive connections in greater detail and outline how each area is informed and supported by research.

Figure 1. System 44*'s* context *for instruction and learning, instructional* content*, and grounding in* cognitive connections *are integrated to form a comprehensive foundational reading intervention.*



The Older Struggling Reader

Despite its documented advantages, early intervention is not an option for all struggling readers. Intervention is needed for older struggling readers because, despite the best efforts of K–3 teachers, some students continue to struggle in the fourth grade and into high school. In fact, researchers have found that many students do not begin to struggle until grade four or beyond.

Explanations of late-emerging reading disability vary, and different explanations pertain to individual students. Much research, however, suggests that their decoding skills prove insufficient as words become more phonologically and morphologically complex. In fact, Juel (1991) reported that some students with late-emerging reading disability have never learned to decode. In primary grades, they appeared to be successful readers by relying on memorization of words. Faced with more challenging material, they could not manage with memorized words alone. As Marilyn Adams explains, "Without phonics, readers' only recourse would be to rote memorize their way to literacy. But there are just too many words to make that a hopeful strategy." In addition, students who are English language learners and students enrolled in special education may have particular challenges perceiving and producing the sounds needed for English (Craig & Washington, 2006).

The most challenged older readers may lack the foundational phonological, decoding, and morphological skills necessary to progress in the face of increasingly challenging texts. These students

- know some but not all of the decoding elements they need to progress;
- lack automaticity in word recognition; and
- face the challenges of reading more complex texts than younger readers. Therefore they have a more urgent need to integrate phonology, sound-spellings, word strategies, morphology, and word recognition into sentence and text reading. They need to recognize a greater number of words by both their spelling patterns and their meanings.

A variety of other factors can also contribute to difficulties with foundational reading skills among older students. For example, researchers have found associations among reading deficits and poverty (Chall & Jacobs, 2003; Chall, Jacobs, & Baldwin, 1990; Lee, Grigg, & Donahue, 2007; Zill et al., 1995), parental reading level (Chall, Jacobs, & Baldwin, 1990; Honig, Diamond, & Gutlohn, 2000), and/or biological, cognitive, neurological, or psychological learning issues. Students can also become struggling readers through lack of practice (Stanovich, 1986) or if they move between states with differing grade-level standards and expectations. Struggling readers may include students who have difficulty mapping to standard English phonology, conventions, and syntax due to community, regional, cultural, or vernacular dialects (Craig & Washington, 2006; Labov, 2006) or differences between English and their primary language. They may also include students with sensory impairments or other disabilities.

Negative impacts of reading failure extend to achievement in all academic areas, extracurricular activity, and peer relations.

Whatever the cause, reading failure in the upper grades can be self-perpetuating. In the article "Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy," Stanovich (1986) explains that, rather than gaining vocabulary through reading, struggling readers do not enjoy reading and read less than "richer" successful readers. The resulting lack of vocabulary growth continues to inhibit reading development (Blachman, 1996; Walberg, Strykowski, Rovai, & Hung, 1984; Walberg & Tsai, 1983). Negative impacts of reading failure extend to achievement in all academic areas, extracurricular activity, and peer relations (Stanovich, 1986). In addition to being at risk for dropping out of school (e.g., McLeskey & Grizzle, 1992; Lichtenstein & Zantol-Wiener, 1988; National Center for Education Statistics, 1999), adolescents with reading disabilities have been found to be at higher risk of social problems (Sabornie, 1994; Wiener & Schneider, 2002), impaired self-concept (Boetsch, Green, & Pennington, 1996; Chapman, 1988), and substance abuse (Beitchman, Wilson, Douglas, Young, & Adlaf, 2001).

It is not only reading that is at stake, either; students' entire education depends so heavily on reading. For example, the connection between reading and math is a concern; in a 2002 study, Fuchs and Fuchs found that students with reading and math disability scored lower on tests of arithmetic story problems than students with math disability alone. The good news is that intervention can help struggling readers succeed across academic areas.

About English Language Learners

Throughout *System 44*, the program design reflects a consideration for the needs of English language learners. It is important to note that while many English language learners face particular challenges in U.S. schools, as outlined below, designing instruction to address those challenges serves to enhance the instructional experience for all students. Just as focusing on the needs of students in special education has led to a greater understanding of the foundational role of phonemic awareness in all students' reading acquisition, focusing on the needs of English language learners highlights important elements of reading instruction, such as building background knowledge and developing academic vocabulary, that are beneficial to all *System 44* users.

English language learners represent one of the fastest growing subgroups of students in America's school-aged population. As of 2006, there were over 5 million English language learners in Grades K–12 (NCELA, 2007). It is estimated that by 2015, up to 30% of the nation's public school children will be English language learners (Francis, Rivera, Lesaux, Kieffer, & Rivera, 2006). This population of English language learners is extremely diverse. While Spanish is the predominant home language (spoken by 79% of ELLs), over 400 different home languages are represented (NCELA, 2002). The academic and linguistic needs of English language learners vary widely based on factors such as their level of schooling prior to arrival in the U.S., their level of proficiency in their home language, and the length of time they have been in the U.S.

Many English language learners face a triple challenge as they strive to succeed in U.S. schools: they must simultaneously develop English language proficiency, learn to read and write in English, and build a knowledge base in the content areas. Many are able to thrive academically despite these challenges. At the same time, a significant proportion of English language learners—even those who may be proficient in conversational English—struggle with academic language, text, and content. Some of these students need intensive phonemic awareness and phonics instruction and/or intervention; it is estimated that approximately the same proportion of English language learners as native English speakers have difficulty with foundational word-reading skills (Francis et al., 2006). For this reason, in their Center on Instruction report on research-based recommendations for the instruction of English language learners, Francis et al. (2006) recommend that "ELLs need early, explicit, and intensive instruction in phonological awareness and phonics in order to build decoding skills" (p. 17). As the research and program description below indicate, the design of *System 44* reflects such research-based recommendations for serving the needs of older English learners who are struggling readers—recommendations that also serve to enrich instruction for all students.

Many English language learners face a triple challenge as they strive to succeed in U.S. schools: they must simultaneously develop English language proficiency, learn to read and write in English, and build a knowledge base in the content areas.

The bottom line is that many older struggling readers, whether they are native English speakers or English language learners, haven't learned to "crack the code." In other words, they have not learned to work the "system" of reading and writing. Locked outside the system, many of these readers are alienated from school and demotivated by years of academic failure. *System 44* is for those older readers.

System 44: Designed for the Diverse Needs of Older Struggling Readers

Given the varying profiles of older struggling readers, an intervention program should provide universal access with multiple means of representation and multiple means of expression, as well as differentiated and individualized instruction.

Research Says...

Because no two students show the same patterns of strength, weakness, and preference within learning networks, no single representation, no single strategy for action, and no single means of engagement will work for all students. Universally designed instructional material should include (1) multiple representations of content, (2) multiple means of expression and control, and (3) multiple options for engagement (Rose & Meyer, 2000). Each of these principles offers the learner various and increased forms of control and engagement with the materials" (Hasselbring, Lewis, & Bausch, 2005).

Designing for universal access improves students' participation in the general education curriculum (Hitchcock & Stahl, 2003; Rose & Meyer, 2000). "Designing for the divergent needs of special populations increases the usability for everyone" (Rose & Meyer, 2000).

Technology can be created according to principles of "universal design," where it can be designed to accommodate differences among users, including but not limited to people with disabilities of various types (Center for Applied Special Technology, 2002).

Students who may be uncomfortable having their struggle with reading exposed can benefit from the private assistance that technology offers (Dukes, 2005).

Students who are English language learners and students enrolled in special education may have particular challenges perceiving and producing the sounds needed for English (Craig & Washington, 2006). Fortunately, research has revealed that articulation exercises and the visual reinforcement of seeing a speaker's face can help struggling ELLs, hearing-challenged students, and autistic learners to perceive and generate the sounds of English (Bosseler & Massaro, 2003).

Many English language learners need to acquire new phonemes or orthographic patterns as well as new matches between phonological segments and orthographic patterns (Durgunoglu, Nagy, & Hancin-Bhatt, 1993). While individual speech sounds often map from first language to second language (Gersten & Geva, 2003; Quiroga, Lemos-Britton, Mostafapour, Abbott, & Berninger, 2002), some English language learners may still need "early, explicit, and intensive instruction in phonological awareness and phonics" (Francis et al., 2006).

For Spanish native speakers, explicit instruction in Spanish-English cognates is an effective method of facilitating the acquisition of English—both conversational and academic—and developing reading comprehension across the content areas (Calderón, 2007).

System 44 Delivers...

- *System 44* employs Universal Design for Learning (UDL), a set of principles that promotes the creation of flexible goals, methods, materials, and assessments to accommodate all learners' differences. Its multimedia, multisensory instruction provides multiple means of representation in printed material and software with digital, audio, and visual support. Students have many opportunities to use visual, aural, kinesthetic and tactile modalities, including visual and tactile experiences with mouth positions to aid with pronunciation. *System 44* further provides multiple means of expression to offer students alternative ways to show what they know.

- In *System 44* differentiated and individualized instruction are achieved by the integration of multiple assessments, multiple entry points, adaptive computer technology, and targeted instructional materials and strategies. Teachers can thus create learning environments for multiple purposes to meet the needs of individual students. Two distinct tracks in the software—Standard and Fast-Track—further individualize instruction with adaptive pacing, allowing students to skip content for which they already show mastery and focus more closely on their specific areas of need. Additionally, the software's supportive coaching and immediate, corrective feedback help ensure that struggling or challenged students do not feel uncomfortable about not mastering specific skills as quickly as their classmates.

- *System 44* provides many supports that are beneficial to English language learners who are experiencing difficulty learning to read. All English language learners can benefit from the program's diagnostic instruction in phonics that addresses students' individual needs, through the placement test, multiple entry points, and opportunities for Fast-Track acceleration. English language learners with beginning and intermediate English proficiency levels will particularly benefit from the vocabulary supports incorporated throughout the program, including picture cues and context sentences in the software and *Decodable Digest*, explicit vocabulary instruction in teacher-led lessons, and audio and visual models of correct pronunciation in the software and teacher-led lessons. The software and teacher-led lessons also offer Spanish translations and instruction in Spanish cognates. *System 44* instruction builds on students' primary language strengths and addresses specific language needs; for example, the contrastive analysis in the *Teaching Guide* provides instructional strategies for transferable and nontransferable skills in various languages. Like native English speakers, English language learners are able to apply and practice their learned skills in *System 44*'s decodable texts that provide frequent opportunities to experience success reading decodable and sight words in varied contexts.

The Teacher

Teachers of older struggling readers face the impressive professional responsibility of accelerating their students' learning to grade level. Furthermore, federal legislation like No Child Left Behind holds teachers accountable for their students' progress. To meet the diverse requirements of struggling older readers, teachers need to meet students where they are and fill in any gaps in their knowledge. To do so requires differentiated instruction, but teachers have limited time for the individual placement and diagnostic assessments necessary to drive differentiated instruction, and for ongoing assessments to monitor and adapt instruction.

Once they have assessed students' knowledge, teachers also need to design systematic, explicit, adaptive, and differentiated instruction for students at different levels and with different instructional needs. The challenge of researching new and best practices, designing effective instructional routines that scaffold and engage, providing corrective feedback, and modifying instruction for diverse student needs can be daunting.

Teachers have limited time for the individual placement and diagnostic assessments necessary to drive differentiated instruction, and for ongoing assessments to monitor and adapt instruction.

For older students who lack foundational phonological, decoding, and morphological skills, teachers need to provide comprehensive content that covers all the phonemes, graphemes, spelling patterns, morphemes, and syllabic patterns for students who need them, as well as selective content for students who have mastered some but not all decoding elements. They need to teach students to recognize words both by analysis of the sounds and letters that make them up and by the meanings they convey. In addition, they need to provide adaptive instruction that quickly transfers from foundational phonological and decoding strategies to integrated reading skills. To build understanding of word strategies, teachers must also provide metacognitive instruction.

Despite the enormity of the task, teachers can help all students improve if given enough support. *System 44* provides such support.

System 44: Designed to Provide Comprehensive Teacher Support

The more support teachers receive, the better the instruction they can provide.

Research Says...

Scaffolding is one of the key principles of effective instruction that enables reading programs to accommodate individual student needs (Kame'enui, Simmons, Coyne, & Chard, 2000).

In addition to teacher scaffolding of learning, new technologies providing scaffolds and tools can be used to enhance learning. "These designs use technologies to scaffold thinking and activity, much as training wheels allow young bike riders to practice cycling when they would fall without support. Like training wheels, computer scaffolding enables learners to do more advanced activities and to engage in more advanced thinking and problem solving than they could without such help" (Bransford, Brown, & Cocking, 2003).

"The value of in-depth classroom assessment comes from teachers' deep understanding of reading processes and instruction, thinking diagnostically, and using the information on an ongoing basis to inform instruction (Black & William, 1998; Place, 2002; Shepard, 2000)" (Valencia & Riddle Buly, 2004).

Teachers "have limited time to assess students' performances and provide feedback, but new advances in technology can help solve this problem... Ultimately, we believe that dynamic assessment environments will yield interesting information that will be valuable to both teachers and students" (Bransford, Brown, & Cocking, 2003).

System 44 Delivers...

- *System 44* frees the teacher from many time-consuming tasks, provides the teacher with data to inform instruction, and supports the teacher in scaffolding and differentiating instruction. The computer adaptive *Scholastic Phonics Inventory* (SPI) places students within the sequence of instruction and provides important information to inform daily, data-driven instruction in small-group differentiated rotations. In the Scholastic Achievement Manager, teachers can view actionable reports about student progress and gaps in knowledge, and access links to relevant resources for differentiating.
- *System 44* software uses adaptive and audio technology to customize and scaffold individual skill practice. The Software also continually collects data about student performance and provides continuous corrective feedback to the student, freeing the teacher to focus on targeted direct instruction. The *System 44 Teaching Guide* assists teachers in scaffolding direct instruction for students during whole- and small-group lessons.
- Teacher in-services, teacher resources, and instructional manuals further support teachers in tailoring instruction for diagnosed needs and metacognitive learning, and in creating learning environments for multiple purposes, including acceleration, improvement, or reinforcement.

Technology and Text

Adaptive technology and engaging, carefully selected text can go a long way in meeting the challenges facing older struggling readers and their teachers. Both technology and text can provide students with opportunities for individualized application and practice of crucial skills, and they can create the motivating environment crucial to learners who have experienced years of disheartening struggle with reading. The teacher can also use technology and print materials as resources for planning, differentiating, and complementing direct instruction.

Technology and appropriately leveled text allow students greater control of their learning process and pace.

Bransford, Brown, and Cocking (2003) point out that several reviews of the literature on technology and learning support the great potential of technology to enhance student achievement when used appropriately (e.g., Cognition and Technology Group at Vanderbilt, 1996; Dede, 1998; Panel on Educational Technology, 1997). One important characteristic of technology is that it can be highly motivating for older struggling readers. The Internet is a part of daily life for American youth (Rand Reading Study Group, 2002), and many students play games on the computer. Game-like formats engage students and hyperlinks such as clickable words allow students to access additional information quickly or to see words used in multiple contexts (Boardman et al., 2008; Wood, 2001). Students can use a valued and familiar tool to acquire the knowledge and skills they need while developing the technology skills required in today's workplace.

Print materials can also play a crucial role in engaging the older struggling reader. In *Reading Next*, Biancarosa and Snow (2004) note that "high-interest, low-difficulty texts play a significant role in an adolescent literacy program and are critical for fostering the reading skills of struggling readers and the engagement of all students." When providing texts for older struggling readers, it is important to match the text to their reading level, not higher or lower (Gambrell, Palmer, & Coding, 1993). Furthermore, older readers need content that is age-appropriate and relevant to their interests in order to stay engaged (CREDE, 1999).

Technology and appropriately leveled text allow students greater control of their learning process and pace. According to Lichtenstein and Zantol-Wiener (1988), "the search for independence and the struggle for autonomy" are foremost in the minds of many adolescents. Self-directed technology creates a sense of engagement and independence (Hasselbring, Lewis, & Bausch, 2005). Moving at their own pace in independent reading and experiencing daily success with age-appropriate, decodable text increases students' confidence and motivation (Pressley, Gaskins, Solic, & Collins, 2006).

Technology and print materials can also be designed to maximize learning potential based on research about how the brain learns best. For example, we learn best if we stimulate several senses at one time (Medina, 2008). Computer technology offers superior capacity to deliver multisensory and multimodal presentations. Similarly, technology can provide multiple examples and repetition, spaced over time, to enhance memory for learned concepts (Medina, 2008; Wagner et al., 2000). Print materials can couple text with picture cues and other visuals to enhance comprehension.

Students who can quickly and accurately recognize words are more likely to comprehend what they read (Lesgold & Resnick, 1982; Naslund & Samuels, 1992). Repeated, frequent practice with reading text helps students build automaticity in decoding and recognizing words, which frees up mental energy for comprehending (Freedman & Calfee, 1984). Computers can provide individualized practice to students who need to increase their automaticity, and they have proven beneficial in developing decoding fluency (Jones, Torgesen, & Sexton, 1987; Roth & Beck, 1987). Furthermore, growing evidence suggests that computer-based effects such as animation and sound help students make connections between sound/spelling patterns, prior knowledge, and context clues to extract meaning from what they read (Matthew, 1996).

Technology can help solve some of the problems confronting teachers of diverse struggling readers, such as limited time to assess students' performances and provide feedback (Bransford, Brown, & Cocking, 2003). In addition to assessment, adaptive technology can provide differentiated, scaffolded instruction and individualized corrective feedback. Software can continuously monitor progress and deliver data to drive differentiated instruction, thus freeing the teacher for those important tasks teachers do best.

System 44: Putting Adaptive Technology and Supportive Text to Work for Teacher and Student

Adaptive technology can enhance learning by its ability to scaffold and individualize instruction, provide corrective feedback, monitor student progress, and offer essential data to teachers who guide students to become proficient readers and learners. High interest, leveled, and diverse texts can help older readers experience success and motivate them to continue reading.

Research Says...

Differentiated instruction aims to optimize learning opportunities and outcomes for all students by tailoring instruction to meet their current level of knowledge and prerequisite skills (Bickel, 1998; Bos & Vaughn, 2002; Hall, Strangman, & Meyer, 2003; Simmons et al., 2002). Teachers who rely mostly on whole-group instruction do not adequately meet the individual needs of students who need extra literacy support (Avalos, 2006).

"Technology has become an important instrument in education" (Bransford, Brown, & Cocking, 2003). In a meta-analysis by the National Reading Panel (2000), all the studies using computer technology for reading instruction reported positive results.

Adaptive technology breaks down tasks into steps, administers feedback immediately, and supports independent practice (Estevez et al., 2003). Technology that affords students the opportunity to practice new skills systematically, with information presented in manageable sets, fosters automaticity (Hasselbring & Goin, 2004).

The Internet figures prominently in the lives of American youth, particularly suburban youth (Barton, Hamilton, & Ivanic, 2000; Beach & Lundell, 1998). Creating technology environments that heighten students' motivation to become independent readers and writers can increase their sense of competency (Kamil, Intrator, & Kim, 2000).

"The use of modern technology provides clear advantages" when developing "flexible, supportive, and adjustable learning and productivity experiences" for all students (Hitchcock & Stahl, 2003).

An effective literacy intervention for adolescent readers should include high-interest, low-difficulty texts on a wide variety of topics and subject areas (Biancarosa & Snow, 2004).

To ensure that students have successful reading experiences, it is important to provide them with texts that match their reading level—not too easy and not too hard (Gambrell, Palmer, & Codling, 1993).

As students relate what they are reading to their personal experiences, they become better connected with the characters and content of the texts they read and, therefore, are more motivated to read (CREDE, 1999).

System 44 Delivers...

- *System 44* harnesses the power of research-based software that combines learning theory, pedagogical principles, and integrated media technology in a unique way. The software uses adaptive and audio technology to customize and scaffold individual skill practice and application in phoneme manipulation, word recognition, vocabulary, spelling, comprehension, and fluency. Throughout, the software offers consistent and targeted support with nonjudgmental and individualized coaching.

- *System 44*'s FASTT (Fluency and Automaticity Through Systematic Teaching with Technology) technology helps students move information from working to long-term memory. Adaptive pacing of practice in the FASTT model moves students to automaticity. The multisensory approach in *System 44* further improves recall by combining audio and visual support. For example, every new word in the technology is linked with a picture and a context sentence, both of which help learners commit the word meaning and underlying concept to memory.

- Ongoing assessment allows the software to differentiate and adapt instruction to student needs and customize corrective feedback to their specific errors. Customized technology lessons allow for differences in the student's prior knowledge and learning styles. In the software, two distinct tracks—Standard and Fast-Track—further individualize instruction with adaptive pacing, allowing students to skip content for which they already show mastery and focus more closely on their specific areas of need. The *Scholastic Phonics Inventory* and the reports available in the Scholastic Achievement Manager provide important information to teachers to inform daily, direct, data-driven instruction in small-group differentiated rotations.

- *System 44*'s print materials provide further opportunities for teachers to regularly check for understanding and assess mastery of skills. Every teacher-directed lesson in the *Teaching Guide* concludes with an informal assessment. These curriculum-embedded assessments, implemented in small groups, use the cloze format to check decoding and word recognition skills in the context of reading for meaning. *System 44* also includes two print-based Summative Assessments, a Midyear Test and an End-of-Year Test, that help monitor how well students have maintained skills and whether they can apply and transfer those skills to new contexts.

- *System 44*'s wide variety of texts provide students with daily opportunities for modeled and independent reading with high-quality fiction and nonfiction materials, in order to transfer and reinforce decoding skills and develop reading fluency. The *44Book* includes high-interest, decodable reading selections, linked with teaching strategies that engage and motivate struggling readers. The *System 44* Library offers students age-appropriate, relevant books they can read with success, and the *Decodable Digest* provides further opportunities to practice decoding and improve automaticity, with over 9,000 words of decodable text passages. Readings in all *System 44* print materials reflect ethnic, cultural, and linguistic diversity and focus on engaging topics such as careers, music, heroes, relationships, health, and family, so that students feel they are reading about their interests and their personal experiences

Overview

System 44 is designed so that the teacher, technology, and texts work together to deliver highly engaging, comprehensive, research-based instructional content to the older struggling reader. The backbone of *System 44* is a well-planned scope and sequence covering the foundational skills that older readers need to accelerate to grade level and to progress in the face of increasingly challenging texts. Through a combination of teacher-led and software-based instruction, the *System 44* student is guided along a systematic path from phonemic awareness to fluent reading. Each key element of the *System 44* instructional content was specifically designed with the older struggling reader in mind:

- **Efficient Screening, Placement, and Progress-Monitoring Assessments.** *System 44* assessment goes beyond placement. The reading profiles of older struggling readers have been compared to Swiss cheese because of the holes in their knowledge base and skill sets. The technology regularly assesses student knowledge prior to new lessons, and students who demonstrate mastery of upcoming content are accelerated to the next appropriate lesson, ensuring that no students will be wasting precious time in the race toward grade level competence.

- **Phonemic Awareness and The Older Struggling Reader.** The instructional sequence for phonemic awareness lessons is adapted to the needs of older readers, with the most stable, frequent, and highest utility sounds introduced first so that students can quickly begin to experience success connecting sounds to letters and decoding words.

- **Phonics Foundations for The Older Struggling Reader.** Special emphasis is placed on the elements that are most critical to older, struggling readers: the vowels. Because vowels are elements of the deep orthography that makes English a challenge to learn, *System 44* provides a laser-like focus to expedite learning. *System 44* teaches "vowel spotting," or locating the number of pronounced vowels in a word to identify syllables. The technique has been found beneficial to struggling English language learners and others on their way to decoding mastery.

- **Word Analysis (Syllabication and Morphology).** Older students need to read multisyllabic words in grade-level texts. Early in the sequence, *System 44* begins teaching the strategies for decoding multisyllabic words as the building blocks are mastered. High frequency morphemes are introduced, together with morphological word-reading strategies. Developing morphological and syllable sense enables older students to read essential words across the curriculum.

- **Spelling.** Decoding and encoding (spelling) are taught as reciprocal skills. Mindful of the educational adage that says, "Good readers may not be good spellers but good spellers are invariably good readers," *System 44* ensures that students learn to spell and write.

- **Sight Words.** Beyond decoding, students are concurrently learning high-frequency sight words from word lists customized to their assessed needs. This allows older readers to experience success quickly as they integrate sight words and sound-spellings to read decodable text.

- **Vocabulary, Usage, and Meaning.** Meaning is the "ribbon" that ties the *System 44* curriculum together, according to Dr. Marilyn J. Adams. Word meanings are explained, exemplified, and, whenever possible, pictured. Meaning is also explored as students study morphological word families, roots, prefixes, endings, and suffixes. Thus older readers learn words both by analysis of the sounds and letters that make them up and by the meanings they convey.

- **Putting It All Together: Reading.** As older struggling readers integrate sound-spellings, word strategies, vocabulary, and sight words, they work toward fluency and automaticity so they can struggle less and read more.

The rest of this section describes in greater detail how each key element of the *System 44* instructional content reflects research about effective interventions for older struggling readers.

Efficient Screening, Placement, and Progress-Monitoring Assessments

A comprehensive assessment program should provide a complete picture of each student, allowing teachers to monitor student understanding and progress and to differentiate instruction, reteach, and reinforce skills based on actionable data.

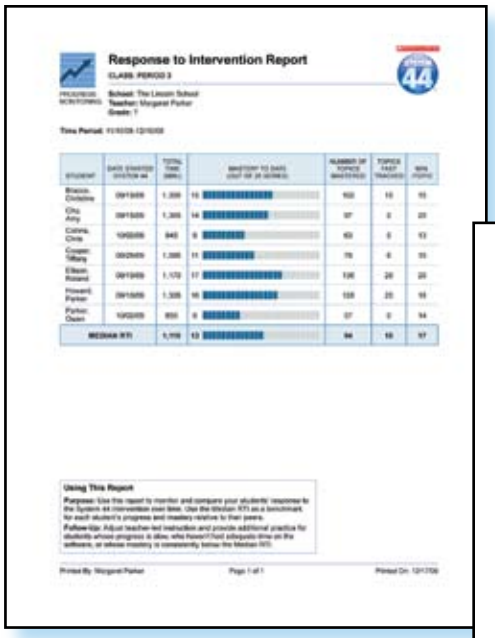
Research Says...

"Older students vary greatly in both the causes and manifestations of their reading problems" (Boardman et al., 2008). Ongoing assessment and progress monitoring are vital to documenting student growth and determining the need for modifying instruction (Fuchs, Deno, & Mirkin, 1984; Fuchs & Fuchs, 2004; National Reading Panel, 2001; Stecker, Fuchs, & Fuchs, 2005; Torgesen, 2002).

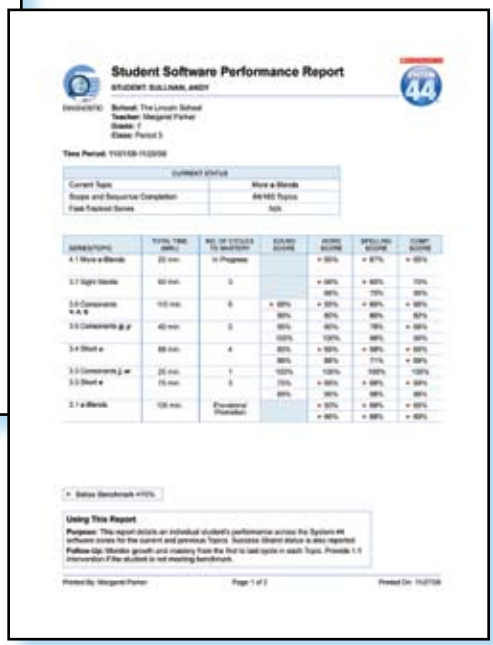
According to Wagner (2008), several studies of struggling adolescent readers suggest that a substantial proportion had problems with word-level reading. In some cases, deficits in phonics and word recognition may not be evident until fourth grade (Catts, Hogan, & Adlof, 2005; Chall, 1996; Hock et al., in press; Juel, 1988; Leach, Scarborough, & Rescorla, 2003; Lipka, Lesaux, & Siegel, 2006). Such findings underscore the necessity of using reliable and efficient methods to assess phonological decoding in the middle and upper grades.

"Technology creates a sense of engagement that is incomparable to what most students experience with paper-and-pencil test administration. The self-directedness of the accessible online assessment gives many students a feeling of empowerment that can facilitate a more accurate display of student ability" (Hasselbring, Lewis, & Bausch, 2005).

When students are informed of the incremental gains they are making, they better understand and acquire a sense of ownership over their own academic growth (Hupert & Heinze, 2006).



Response to Intervention Report



Student Software Performance Report

System 44 Delivers...

- *System 44* begins with appropriate placement. The computerized *Scholastic Phonics Inventory* (SPI), a research-based, validated assessment, identifies students who need word level instruction, and also identifies the appropriate point of entry for each student in the program's continuum of phonics instruction. SPI also provides important information to teachers to inform direct, data-driven instruction in small-group differentiated rotations.

- In Scholastic Achievement Manager, teachers can at any time access actionable reports about student progress to determine the response to intervention for each student. In addition, these reports link to relevant resources for differentiating instruction. The *System 44* software helps teachers identify holes in students' knowledge so that these skills can be reinforced through direct instruction. Teacher in-services, teacher resources, and instructional manuals support teachers in tailoring instruction for diagnosed needs.

- *System 44*'s diagnostic assessment and reporting also provide students with individualized pacing and a sense of ownership over their learning. Regular Fast-Track assessments in the software check mastery of skills, accelerating students to the next appropriate instructional level to ensure maximum success and optimize instructional time. As the software tracks individual student progress, students can view their progress in on-screen charts and printed reports, making success a visible and measurable experience.

Phonemic Awareness and The Older Struggling Reader

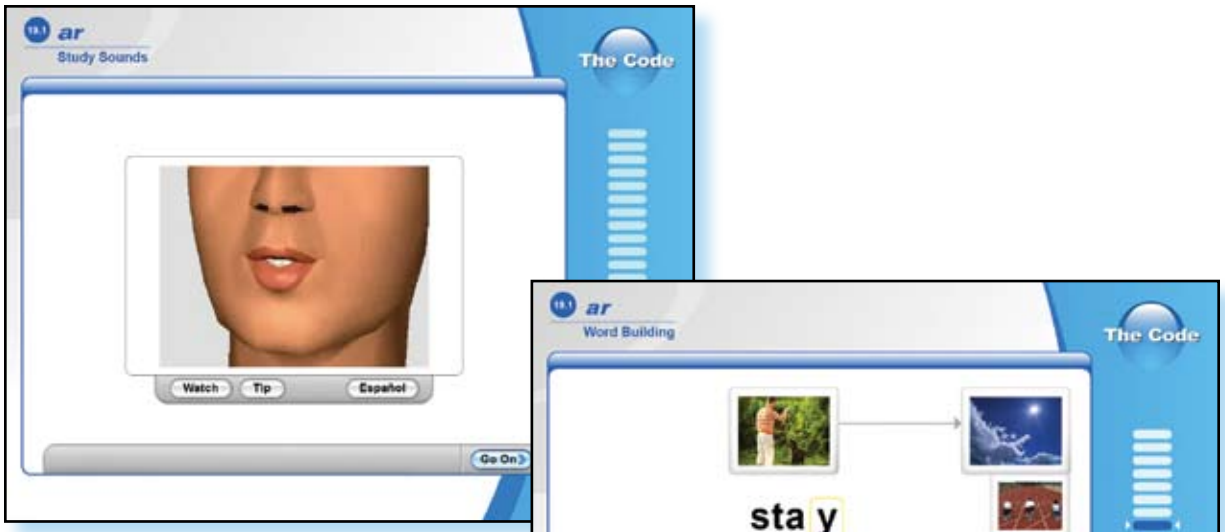
A strong and consistent relationship exists between reading acquisition and phonemic awareness. In order to read, students must be able to hear and manipulate individual speech sounds.

Research Says...

The ability to understand and manipulate phonemes strongly correlates with success in reading through 12th grade (Adams, 1990).

In very poor readers the inability to identify speech sounds impedes spelling, word recognition, and vocabulary development. These students benefit from direct instruction on speech sound identification and phonological skills, which improves spelling, word recognition, and vocabulary development (Moats, 2001).

In some cases, phonological deficits may not be evident until the third and fourth grades. Without intervention, weak phonics skills are likely to impede reading ability in subsequent years (Lipka, Lesaux, & Siegel, 2006). The difficulties associated with reading appear to reflect a persistent deficit in phonological skills through adulthood (Siegel & Ryan, 1989; Snowling et al., 1997; Wilson & Lesaux, 2001; Lipka, Lesaux, & Siegel, 2006). In addition, a number of studies have shown that adult illiterates essentially lack awareness of phonemes (Morais, 1991; Adams et al., 1998).



Study Sounds in The Code Strand

Word Building in The Code Strand

System 44 Delivers...

- *System 44* delivers research-based, scaffolded, systematic instruction in the 44 speech phonemes of English, providing the foundational literacy skills that are essential to the academic success of older struggling readers. Direct instruction in teacher-led lessons and the software develop phonemic awareness skills in the context of decoding, or word identification, and encoding, or spelling. Correct pronunciation and articulation of phonemes is reinforced by the teacher and with video models in the software.
- Students have many opportunities to use visual, aural, kinesthetic and tactile modalities to strengthen phonemic awareness. For example, in the software and in teacher-led lessons with letter tiles, students manipulate letters and morphemes to create new words. This visual/tactile activity builds phonemic awareness as students add and subtract phonemes.
- Teacher-led S.M.A.R.T. (Strategies for Metacognition, Academic Language, Reading, and Thinking) lessons provide metacognitive training in blending, segmenting, and other phonemic awareness skills and strategies.

Phonics Foundations for The Older Struggling Reader

A strong and consistent relationship exists between reading acquisition, comprehension, phonics, and decoding skills among older struggling readers. Skilled readers recognize correspondences between sounds and letters, and are able to blend these letter-sound correspondences together to read and write words.

Research Says...

"...[R]esearch now affirms that weaknesses in decoding abilities are the most common and debilitating source of reading difficulties (Perfetti, 1985; Shankweiler et al., 1995; Stanovich, 1986; Vellutino, 1991; Vernon, 1971)" (Adams et al., 1998). Numerous studies show that "poor word identification skills are strongly coupled with poor reading comprehension in both children (Perfetti, 1985; Rack, Snowling, & Olson, 1992; Stanovich, 1982; Vellutino, 1991) and adults (Bruck, 1990; Cunningham, Stanovich, & Wilson, 1990)" (Adams et al., 1998).

Recent studies of older struggling readers found that more than 60% of the participating students performed at very low levels on basic word-reading skills (Hock, Deshler, Marquis, & Brasseur, 2005; Hock et al., in press; Leach, Scarborough, & Rescorla, 2003; Torgesen et al., 2007).

Technology is a particularly effective method of fostering decoding automaticity because it affords students repeated opportunities to systematically practice new skills until they are mastered (Hasselbring & Goin, 2004).

Direct Instruction in The Code Strand

Read & Record in The Code Strand

System 44 Delivers...

- *System 44* delivers explicit, scaffolded, systematic instruction in the phonological structures of English. Adaptive software activities and teacher-led lessons provide intensive training in letter-sound relationships, segmenting, and blending. Instruction and modeling help students build aural discrimination between sounds and match those sounds to their spellings. Audio and visual effects, such as images, animation, context sentences, and Spanish translations, provide support for students as they blend and read new words.
- *System 44* is designed to scaffold older struggling readers in applying decoding skills to connected text from the start. Thus, the scope and sequence first introduces grapheme-phoneme combinations that are most stable, most useful in making words, and most frequent in occurrence. The software, transfer routines, and teacher-led instruction then scaffold students in transferring newly acquired decoding skills to novel words and connected text on the computer, in the *44Book*, and in the library books and *Decodable Digest*.
- Teacher-led S.M.A.R.T. lessons build metacognitive decoding knowledge and word strategies by directly teaching foundational phonics principles and essential concepts.

Word Analysis (Syllabication and Morphology)

Older struggling readers need systematic, explicit instruction and individualized practice in syllable strategies, structural analysis, and morphological word analysis.

Research Says...

The goal of syllabicating words is to help the reader sound them out correctly. Recognizing open and closed syllables can help identify vowel sounds as long or short (Adams, 1990; Adams et al., 1998).

The decoding of multisyllabic words poses difficulties beyond decoding of single-syllable words (Beck, 2006). Whereas skilled readers can syllabicate words to read them, struggling readers have difficulty syllabicating (Bhattacharya & Ehri, 2004). "While many struggling readers at the secondary level are proficient at reading single-syllable words (stint, core, plan) they may lack strategies to decode the multisyllabic words that are common in higher-level reading materials (Archer, Gleason, & Vachon, 2003)" (Boardman et al., 2008).

Noticing sounds, syllables, and morphemes simultaneously is linked to better memory for learned words (Moats, 1995). Instruction in using morphemic analysis helps students develop more advanced word-recognition strategies. When students understand the meaning of component morphemes and are able to quickly pronounce them as parts of longer words, the speed and accuracy of their reading improves (Nagy, 2005).

Studies of fourth- and fifth-grade students demonstrate the effectiveness of teaching students to break down words into meaningful parts and use prefixes, suffixes, and roots as clues to meaning (Kieffer & Lesaux, 2007; Baumann et al., 2002, 2003). Both Spanish-dominant English learners and English dominant students benefit from the instruction (Kieffer & Lesaux, 2007).

"Quick speed drills, conducted as challenge games to achieve a goal, can build automatic recognition of syllables and morphemes" (Moats, 2001).

Direct Instruction in the Word Strategies Strand

Word Splitter in the Word Strategies Strand

System 44 Delivers...

- The *System 44* Word Strategies software lessons build word attack skills through instruction with word analysis strategies, beginning with English syllable patterns and syllabication. Teacher-led lessons also focus on syllabication, teaching students to count the beats in a pronounced word, identify the graphemes in the syllables, and then blend syllables to read the word.
- Later, *System 44* software and teacher-led lessons teach students to identify morphemes that help them "chunk" words to determine their meanings. Students learn to look for prefixes and affixes, count the "vowel spots" to identify syllables, break the words into syllables, read each syllable, and read the word.
- Thus, *System 44* equips students to decode and determine the meanings of unfamiliar multisyllabic words they encounter in content area reading.

Spelling

Older struggling readers should learn decoding and spelling as reciprocal skills, and should build spelling memory through knowledge of syllable patterns, word structure, and morphemes.

Research Says...

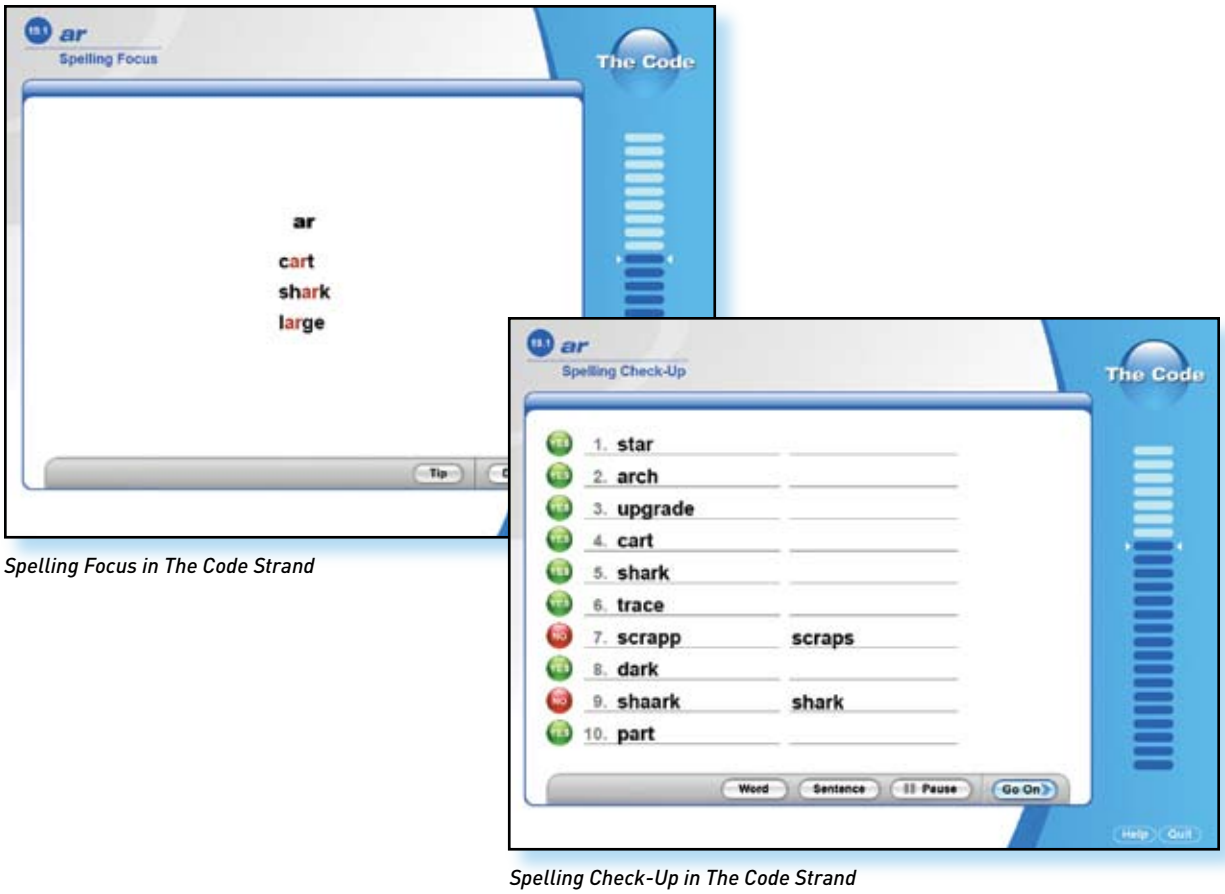
Spelling instruction is most effective when students receive immediate corrective feedback when they make errors. Error imitation and modeling is a validated strategy that involves the teacher reproducing the student's spelling error and then correcting it, highlighting the difference between the incorrect and correct spellings (Gerber, 1986; Moats, 1995). The number of words presented at one time also needs to be limited for poor spellers" (Moats, 1995). (See also Metiri Group, 2008; Sweller, 1988, 1999.)

"At more advanced levels, spelling memory draws on a child's knowledge of word structure, words' meaningful parts, a word's relationship to other words, and so on. Word knowledge builds systematically on other word knowledge" (Moats, 1997).

Readers learn sight words by forming connections between phonemes and the letters that represent them. These connections help readers develop the necessary word memories for automatic sight word recognition (Ehri, 1998; Bhattacharya & Ehri, 2004).

Students who are taught to analyze speech sounds in words and relate them to their spellings progress faster in spelling and reading (Moats, 1995).

For native speakers and English language learners alike, spelling is highly correlated with reading accuracy (Chiappe, Siegel, & Wade-Woolley, 2002; Honig, Diamond, & Gutlohn, 2000).



Spelling Focus in The Code Strand

Spelling Check-Up in The Code Strand

System 44 Delivers...

- Spelling and decoding are taught as reciprocal skills in *System 44*. Each lesson in the *System 44* software includes a Spelling Zone that provides explicit instruction in spelling patterns for words that were used in decoding and word strategies lessons in the same series. The Spelling Zone begins by providing audio and visual examples that reinforce understanding of the targeted sound-spelling. It uses assessment to create a customized list of spelling study words for each student, and it provides systematic practice with immediate, corrective feedback specific to students' errors.
- Teacher-led *System 44* lessons begin with instruction that focuses students' attention on the specific spelling pattern they will encounter in that day's lesson and in the software, and the lessons end with dictation, providing students an opportunity to transfer the spelling patterns they have learned into writing. To minimize overload on students' attention and working memory, new words and spelling patterns are introduced in small, manageable amounts and connected to prior learning.
- *System 44* software and teacher-led lessons provide direct, explicit instruction about meaningful parts and syllable patterns, which helps students in spelling words.

Sight Words

Sight word knowledge is an important element of reading fluency. Older struggling readers need support in building a large vocabulary of sight words that can be recognized automatically.

Research Says...

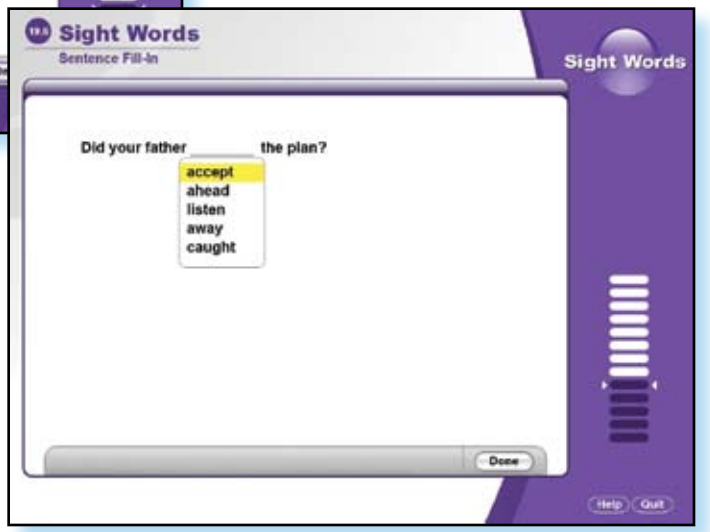
Many of the most high-frequency words cannot be sounded out based on orthographic patterns (Adams, 1994). Approximately 300 high-frequency words make up about 65 percent of all written material (Fry & Kress, 2006).

Repeated, accurate reading of the same word eventually leads to the word being stored in memory as a sight word—one that is identified automatically and without conscious thought (Torgesen, Wagner, & Rashotte, 1999; Torgesen, 2002).

Good phonemic decoding skills are necessary in the formation of accurate memory for the spelling patterns that are the basis of sight word recognition ability (Ehri, 1998; Bhattacharya & Ehri, 2004).

Skilled readers have a large vocabulary of automatically recognized sight words, built through frequent reading. Struggling readers tend to have a harder time building a large sight word vocabulary (Torgesen, Wagner, & Rashotte, 1999; Boardman et al., 2008).

Mix & Match Words in the Sight Words Strand



Sentence Fill-In in the Sight Words Strand

System 44 Delivers...

- *System 44* Technology is designed to get students automatic in recognizing high-utility words that appear with the greatest frequency in text. In the Sight Word strand of the software, students begin with a Check-Up to determine which words they need to study and which are already mastered, to make efficient use of instructional time.
- Software instruction then focuses on building instant word recognition and knowledge of the usage and function of sight words in text. For example, after hearing, reading, and typing a target sight word, a student may be asked to match the word to an audio recording or choose the best sight word to fill in a blank in a decodable sentence. *System 44* teacher-led lessons also include regular direct instruction in high-frequency sight words, using a research-based teaching routine to help students commit the words to memory.
- The *44Book*, *Decodable Digest*, and *System 44* library provide students with further opportunities to practice reading sight words and build automatic word recognition.

Vocabulary, Usage, & Meaning

The recognition of and knowledge about the meaning of words is a critical factor underlying reading proficiency and comprehension in older struggling readers.

Research Says...

"Because the range of vocabulary in text grows rapidly after third grade (Anderson & Nagy, 1992), students must continue to expand their knowledge of word meanings in order to construct the meaning of what they are reading. Vocabulary and verbal knowledge play increasingly important roles in supporting reading comprehension as students move from elementary to middle to high school (Schatschneider et al., 2004)" (Torgesen et al., 2007).

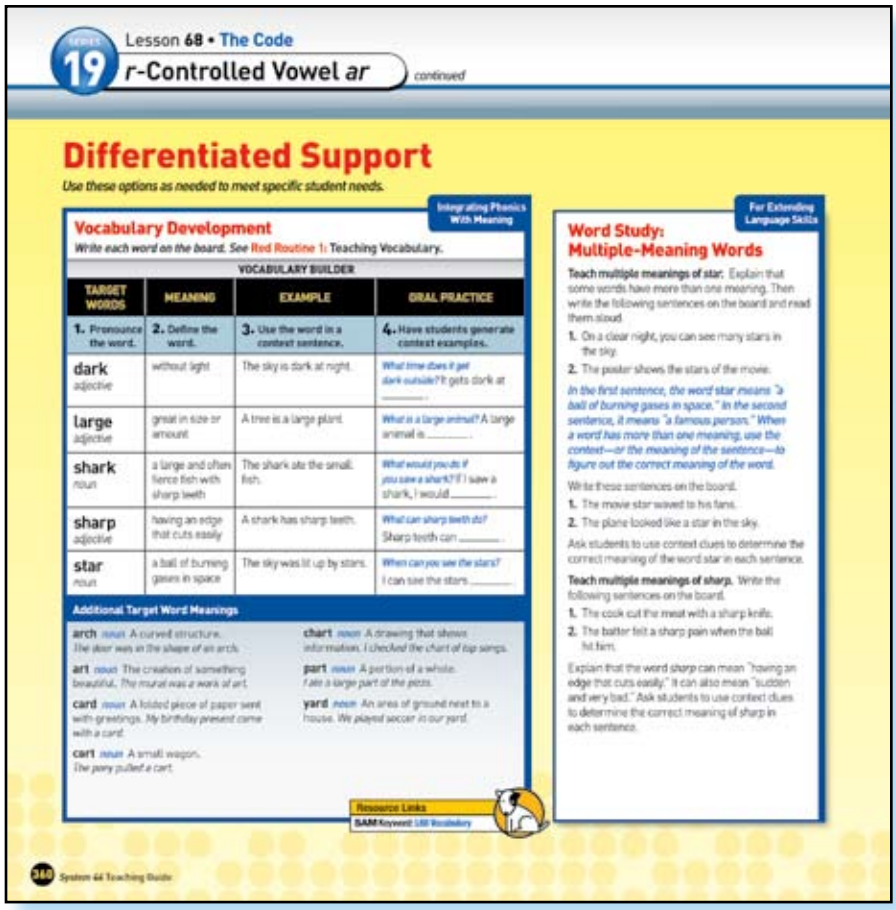
"Numerous studies have documented the positive impact of direct, explicit vocabulary instruction on both immediate word learning and longer-term reading comprehension (Baker et al., 1995; Beck, McKeown, M.G., & Kucan, 2002; Biemiller, 2004; Marzano, 2004)" (Feldman & Kinsella, 2005).

"Stahl and Fairbanks (1986) found that vocabulary instruction providing both definitional and contextual information can significantly improve students' reading comprehension" (Honig, Diamond, & Gutlohn, 2000).

Research shows that morphological awareness contributes to vocabulary growth (Boardman et al., 2008; Nagy, Berninger, & Abbott, 2006). For every word known, a reader who can apply morphology and context should be able to understand as many as three more words (Nagy, Berninger, & Abbott, 2006).

Repetition and multiple exposures to new words are crucial to vocabulary development (National Reading Panel, 2000; Marzano, Pickering, & Pollock, 2002; Stahl & Fairbanks, 1986).

Learning the spellings of new vocabulary words helps students remember their pronunciations and meanings. Spelling is an especially important part of vocabulary learning for English language learners (Ehri & Rosenthal, 2007).



Lesson 68 • The Code

19 r-Controlled Vowel *ar* continued

Differentiated Support

Use these options as needed to meet specific student needs.

Integrating Phonics With Meaning

Vocabulary Development

Write each word on the board. See Red Routine 1: Teaching Vocabulary.

VOCABULARY BUILDER

TARGET WORDS	MEANING	EXAMPLE	ORAL PRACTICE
1. Pronounce the word.	2. Define the word.	3. Use the word in a context sentence.	4. Have students generate context examples.
dark adjective	without light	The sky is dark at night.	*What time does it get dark outside?* It gets dark at _____.
large adjective	great in size or amount	A tree is a large plant.	*What is a large animal?* A large animal is _____.
shark noun	a large and often fierce fish with sharp teeth	The shark ate the small fish.	*What would you do if you saw a shark?* If I saw a shark, I would _____.
sharp adjective	having an edge that cuts easily	A shark has sharp teeth.	*What can sharp teeth do?* Sharp teeth can _____.
star noun	a ball of burning gases in space	The sky was lit up by stars.	*When can you see the stars?* I can see the stars _____.

Additional Target Word Meanings

arch *noun* A curved structure. *The door was in the shape of an arch.*

art *noun* The creation of something beautiful. *The mural was a work of art.*

card *noun* A folded piece of paper sent with greetings. *My birthday present came with a card.*

cart *noun* A small wagon. *The pony pulled a cart.*

chart *noun* A drawing that shows information. *I checked the chart of top songs.*

part *noun* A portion of a whole. *I ate a large part of the pizza.*

yard *noun* An area of ground next to a house. *We played soccer in our yard.*

Resource Links

SAM Keyword: LIB Vocabulary

For Extending Language Skills

Word Study: Multiple-Meaning Words

Teach multiple meanings of star. Explain that some words have more than one meaning. Then write the following sentences on the board and read them aloud.

1. On a clear night, you can see many stars in the sky.
2. The poster shows the stars of the movie.

In the first sentence, the word star means "a ball of burning gases in space." In the second sentence, it means "a famous person." When a word has more than one meaning, use the context—or the meaning of the sentence—to figure out the correct meaning of the word.

Write these sentences on the board.

1. The movie star waved to his fans.
2. The plane looked like a star in the sky.

Ask students to use context clues to determine the correct meaning of the word star in each sentence.

Teach multiple meanings of sharp. Write the following sentences on the board.

1. The cook cut the meat with a sharp knife.
2. The batter felt a sharp pain when the ball hit him.

Explain that the word *sharp* can mean "having an edge that cuts easily." It can also mean "sudden and very bad." Ask students to use context clues to determine the correct meaning of sharp in each sentence.

360 System 44 Teaching Guide

Vocabulary Routines in the Teaching Guide

System 44 Delivers...

- *System 44* provides direct, multisensory, interactive teaching of individual words, independent word learning strategies, morphological syllables, and high-frequency sight words. Every direct instruction lesson in *System 44* includes the preteaching of vocabulary words that students will encounter in the lesson and software. New words are introduced in small, manageable amounts and in groups that share a sound-spelling or morphological pattern.
- *System 44* software and teacher-led lessons provide direct, explicit instruction about splitting words into meaningful parts to help students recognize words and learn their meaning. Context sentences and pictures also offer clues to and practice with meaning.
- Students have multiple exposures to new decodable and sight words, both in isolation and in context, cumulatively over time. Fiction and nonfiction texts offer opportunities to read the words in varied contexts. All *System 44 Library* books preteach key vocabulary that will be encountered in the book. The *Teaching Guide* also includes resources for further word-study instruction.

Putting It All Together: Reading

While each of the preceding elements of instructional content is necessary for skilled reading, none is sufficient on its own. *System 44* is designed to systematically build the students' facility with the multilayered, complex process of extracting and constructing meaning from text. Mastering this process requires that students weave multiple skills together simultaneously, as indicated by Scarborough's (2002) model of skilled reading (Figure 2).

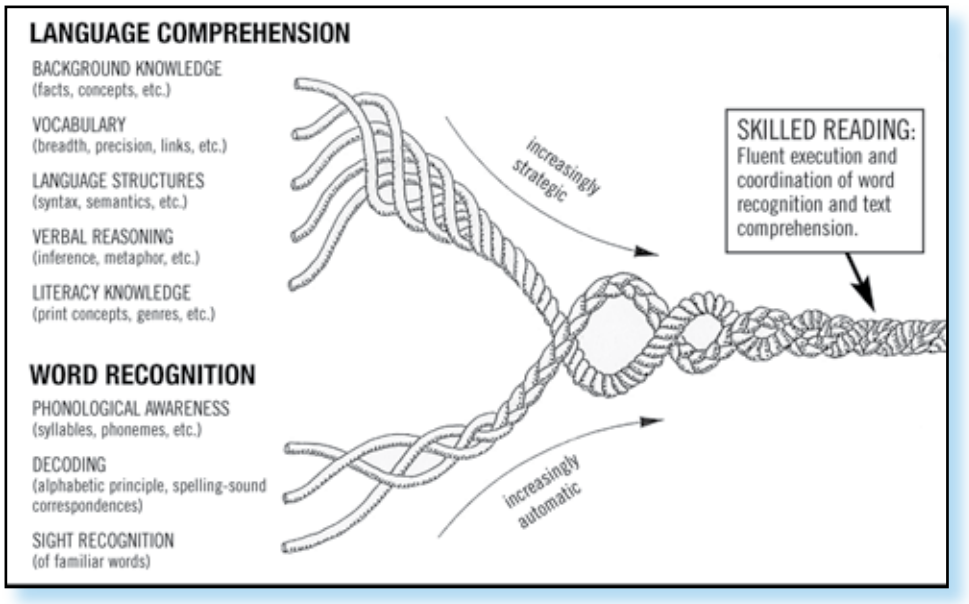
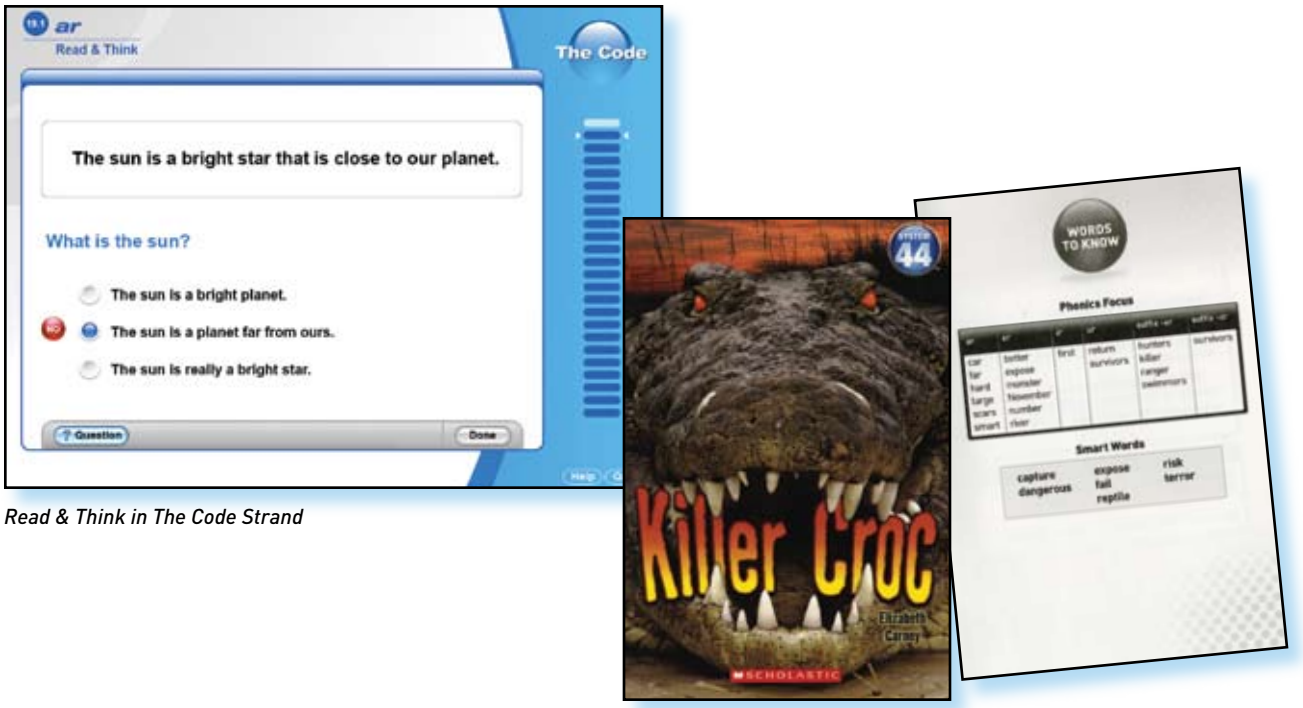


Figure 2: Strands of Early Literacy Development (Scarborough, 2002)

Scarborough's model shows that in order to achieve successful comprehension, students must become proficient with both recognizing individual words ("Word Recognition") and with understanding strings of words in a text ("Language Comprehension"). Skilled readers become automatic enough at the word level and strategic enough at the text level that they are able to coordinate all the strands fluently, allowing them to devote mental energy to understanding the meaning of what they read.

With this goal in mind, *System 44* scaffolds students toward mastery of each strand in the complex process of skilled reading. Students' word recognition skills become increasingly automatic as they engage in lessons on phonemic awareness, phonics and decoding, syllabication and word analysis, spelling, and sight words. Students become increasingly strategic in their language comprehension skills through lessons in vocabulary, usage, and meaning, as well as through software activities and teaching routines that stimulate background knowledge and verbal reasoning and reinforce literacy knowledge.



Read & Think in The Code Strand

Paperback from System 44 Library

Integrated throughout these lessons on specific skills are frequent opportunities to practice weaving the skills together, ultimately building students' capacity to transfer into reading unfamiliar words and connected text. Students regularly practice reading and comprehending decodable sentences appropriate to their stage of skill development.

A content-specific transfer lesson is provided at the end of every set of software lessons in which students view a background video and then read and record a related passage with support. The *Teaching Guide* includes a transfer routine for teachers to use regularly with students. These transfer activities require students to read decodable sentences and passages and think about the meaning of the text.

Students in *System 44* constantly engage in reading connected decodable text in scaffolded passages and high-interest books that showcase the sound-spelling patterns and sight words being studied. The sentences and stories are organized to practice both word recognition and language comprehension skills while providing students with content worth reading.

Overview

The power of *System 44* for the older struggling reader lies not only in the carefully designed instructional content, but also in the way the content is delivered. Informed by research on how the brain learns best, *System 44*'s instructional approach is designed to maximize students' ability to build cognitive connections related to the instructional content.

Some aspects of the *System 44* instructional approach draw on principles of cognition and learning. Brain research shows that there are neurological differences between the brains of struggling readers and those of skilled readers. An intervention designed to improve foundational reading skills in older readers must therefore be designed to impact the learner's brain on functional and neural levels. Thus, *System 44* uses research-based methods of instruction that have been shown to enhance students' ability to absorb new information, retain it, and transfer learning to new situations. Furthermore, *System 44* builds students' metacognitive understanding, helping them tap into thinking in ways that will help them become better thinkers as well as better readers.

Other aspects of the *System 44* instructional approach draw on principles of motivation and engagement. Addressing the affective dimension of learning is crucial because failure can be paralyzing. Believing they should already know how to sound out words at their age, older readers can easily lose interest and let the overwhelming sense of failure discourage them from studying the very skills they need to succeed. Beyond discouraging effort, stress caused by the learned feeling of helplessness can even interfere with brain function (Medina, 2008). The principles of motivation and engagement behind *System 44*'s instructional approach and program design address this dispiriting cycle of failure by helping students connect to and engage with the content.

This section describes how *System 44* harnesses research on both the cognitive and affective dimensions of learning. First, the principles of cognition and learning that inform *System 44*'s instructional approach are described. Second, the principles of motivation and engagement that underlie the program's instruction and design are outlined.

Principles of Cognition and Learning

Brain research offers insights into how individual neurological differences impact learning to read. These insights have been translated into reading interventions that both work with and improve brain function in older struggling readers.

Research Principle

Teaching students to be aware of their own thinking can help them monitor their learning, improve their problem-solving skills, and enhance their ability to apply learning in new situations.

The use of metacognitive strategies helps students "think about their thinking" before, during, and after the task (Boulware-Gooden, Carreker, Thornhill, & Joshi, 2007).

"Metacognitive practices have been shown to increase the degree to which students transfer to new settings and events (Lin & Lehman, in press; Palincsar & Brown, 1984; Scardamalia et al., 1984; Schoenfeld, 1983, 1984, 1991)" (Bransford, Brown, & Cocking, 2003).

Technologies designed for learning can "scaffold thinking and activity, much as training wheels allow young bike riders to practice cycling when they would fall without support. Like training wheels, computer scaffolding enables learners to do more advanced activities and to engage in more advanced thinking and problem solving than they could without such help" (Bransford, Brown, & Cocking, 2003).

System 44 Approach

System 44 teacher-led lessons and software scaffold students in developing metacognitive understanding of the English language's finite system of 44 sounds and 26 letters. Students in *System 44* apply metacognitive strategies as they learn how the system can help them tackle the deep orthography of the English language, how English is structured, and what it all means to them as readers.

Research Principle

Certain approaches to reading instruction can positively affect struggling readers' brains on neural and cognitive (functional) levels.

MRIs of dyslexic readers show decreased activation in left hemisphere brain systems that are important for decoding and fluency (Shaywitz, Lyon, & Shaywitz, 2006). Reading strategies that focus on phonemic awareness and phonics increase activation in these brain regions (Hudson, High, Al Otaiba, 2007; Shaywitz et al., 2002; Shaywitz et al., 2004; Simos et al., 2002; Simos et al., 2007; Temple et al., 2001).

System 44 Approach

System 44 provides instruction that has been shown to enhance brain function in learners. For example, it delivers explicit, research-based, systematic instruction in phonemic awareness and in the phonological structure of English.

Research Principle

Information that is meaningful to the learner can be more easily recalled and learned.

When people understand and think about the meanings of words, they remember them better (Craik & Tulving, 1975; Medina, 2008).

Information is more readily processed if it can be immediately associated with information already present in the learner's brain. Providing examples makes the information better encoded and therefore better learned (Medina, 2008; Palmere et al., 1983).

A growing body of research documents the role of morphologic awareness—the recognition that word parts can carry meaning—in reading and reading disability. In dyslexic students, activation was found to be significantly reduced in the brain regions associated with morpheme mapping. Reading intervention increased brain activation such that quantity and pattern of activation closely resembled that of normally achieving readers (Aylward et. al., 2003).

"Transfer is affected by the degree to which people learn with understanding rather than merely memorize sets of facts or follow a fixed set of procedures" (Bransford, Brown, & Cocking, 2003).

System 44 Approach

In *System 44* new material is presented in ways that help the learner process meaning and integrate the new concepts with previous knowledge. For example, the vocabulary instructional routine teaches students to connect the words used in phonics instruction to meaning. New sound-spelling patterns are introduced in multiple contexts with multiple examples. Background videos in the software help students build mental models of new concepts before reading an informational passage. The software also presents words organized according to sound/spelling patterns, accompanied by pictures and sentences that illustrate their meaning.

Research Principle

Short-term memory is limited in the number of verbal/text items or visual/spatial items it can store simultaneously.

The ability to retrieve useful information from memory appears to be especially challenging for children with learning disabilities or those who are at risk of school failure (Hasselbring et al., 1991).

Short-term memory is limited in the number of items it can store simultaneously. Within working memory, verbal/text memory and visual/spatial memory work together to augment understanding (Metiri Group, 2008; Sweller, 1999). Overfilling either verbal/text memory and visual/spatial memory can result in cognitive overload and cause items to be lost from short-term memory before they can be transferred (Metiri Group, 2008; Sweller, 1988, 1999).

Because of the limits on the amount of information that humans can hold in short-term memory, short-term memory is enhanced when people can chunk information into familiar patterns (Bransford, Brown, & Cocking, 2003; Metiri, 2008; Miller, 1956). Therefore, memory is enhanced by creating associations among concepts. Words presented in an organized, structured way are better remembered than those that are randomized (Medina, 2008).

Technology that affords students the opportunity to practice new skills systematically, with information presented in manageable sets, fosters automaticity (Hasselbring & Goin, 2004).

System 44 Approach

System 44 software uses proven techniques for transferring information in short-term memory to stable, automatic, learned elements in long-term memory. These techniques include introducing new words and concepts in small sets, with multiple exposures at spaced intervals. In the software, the FASTT (Fluency and Automaticity Through Systematic Teaching with Technology) model facilitates transfer from effortful practice in short-term memory to long-term memory, by introducing manageable sets of items, providing repeated exposures, spacing review, and shortening response time. The FASTT technology expands recall by interspersing new elements with a gradually increasing number of known elements during practice. In addition, to create multiple "handles" for retrieval, words, morphemes, and concepts appear in multiple print and software contexts and environments.

Research Principle

Learning activities that include the use of two or more sensory modalities simultaneously to take in or express information are more likely to result in effective learning.

"Our senses evolved to work together—vision influencing hearing, for example—which means that we learn best if we stimulate several senses at once" (Medina, 2008).

Practitioners have learned that parsing language into small pieces with the aid of multisensory experiences, along with direct, systematic, sequential, and cumulative teaching, allows struggling students to learn basic language skills (Birsh, 2000).

Research has revealed that guided practice with recognizing and generating sounds, using a speaker's face to model articulation, can help struggling ELLs, hearing-challenged students, and autistic learners to perceive and generate the sounds of English (Bosseler & Massaro, 2003).

Training software with multisensory presentations helped students improve word writing skills with strong transfer from trained to nontrained words (Kast, Meyer, Vögeli, Gross, & Jäncke, 2007).

Multisensory strategies have proven effective to help English learners make connections between content and language, and to support their communication and social interactions (Facella, Rampino, & Shea, 2005). For example, English learners benefit from learning vocabulary with visual clues to help them understand word meaning (Ybarra & Green, 2003).

System 44 Approach

System 44 offers a multisensory instructional approach that provides students with daily opportunities to view, listen, speak/record, and write. The multisensory approach in *System 44* includes videos, images and graphics, sounds, Audiobooks, several different types of print components, and manipulatives, thus offering multiple entry points for all learners to access and learn the content. Students have many opportunities to use visual, aural, kinesthetic, and tactile modalities, including visual and tactile experiences with mouth positions and building words on the computer and with letter tiles.

Principles of Motivation and Engagement

Motivation and engagement are essential to success, the more so for older struggling readers who need to backtrack before they can move forward. These students need to be inspired to achieve more within a year's time than do their peers with grade-level skills.

Research Principle

Struggling readers who are motivated and engaged in meaningful reading activities for sustained periods are more likely to become proficient readers.

The National Academy of Sciences has identified loss of motivation as one of the three major obstacles some students face when learning to read (Snow, Burns, & Griffin, 1998).

"That engaged and intrinsically motivated children will become more proficient readers than less engaged and less intrinsically motivated children is a truism that generalizes across advantaged and disadvantaged populations and is supported by abundant evidence (e.g., Guthrie, Cox, et al., 1998; Guthrie, Van Meter, et al., 1998; Guthrie, Wigfield, & VonSecker, 2000; Snow et al., 1991; Strickland, 2001; Sweet, Guthrie, & Ng, 1998)" (Rand Reading Study Group, 2002).

Matching students to text with the appropriate level of challenge—not too easy or not too hard—is one mechanism for successful reading experiences (Gambrell, Palmer, & Codling, 1993).

"High-interest, low-difficulty texts play a significant role in an adolescent literacy program and are critical for fostering the reading skills of struggling readers and the engagement of all students" (Biancarosa & Snow, 2004; see also Braunger & Lewis, 1998).

System 44 Approach

System 44 has been designed to draw students into reading and increase their intrinsic motivation to read. *System 44* Library books and videos are high-interest, age-appropriate, relevant to students' lives, and able to generate and sustain student interest. All library books help students set a purpose for reading, making the reading activity more meaningful. In the software, on-screen mentors sustain the learner's engagement and interest by scaffolding, encouraging, and reinforcing his or her efforts. Throughout, reading materials are carefully matched to students' current reading levels as they progress through the program, ensuring that they experience success while being appropriately challenged.

Research Principle

Setting goals for reading activities, tracking progress toward those goals, and rewarding success provide intrinsic and extrinsic motivation for reading and foster engagement.

Research has identified patterns of cognitive-based and affective-based processes that are "set in motion" when a particular goal is adopted over the short or long term (Elliott & Dweck, 1988).

Setting goals provides motivation and encourages the involvement and behaviors that are associated with achievement (Ames, 1992; Boardman, 2008; Guthrie & Humenick, 2004).

Learners of all ages are more motivated when they can see the usefulness of what they are learning (Bransford, Brown, Cocking, 2000).

One factor that affects motivation is known as attainment value. Students will not recognize reading as an important aspect of their lives unless they perceive success in reading to be attainable (Guthrie & Wigfield, 1997).

Academic confidence comes from experiencing academic success daily (Pressley et al., 2006). By giving students ways to feel competent, it becomes more likely that they will learn what is necessary to be successful. In this way, students are able to experience the satisfaction of feeling competent (Sagor, 2003).

System 44 Approach

The *System 44* technology provides multiple opportunities for students to take ownership over their learning by setting goals and monitoring their mastery of lesson content. The Gradual Release Model, used throughout the program, leads to ownership over learning as responsibility for performing a new skill is gradually transferred from teacher to student. Through the technology, students can monitor their own progress and view tangible, quantifiable evidence of achievement. In the software's Success Zone, students experience and celebrate their achievements by watching exciting videos that build mental models for reading, and they read high-interest, engaging passages that include the phonics exemplars, sight words, and multisyllabic words they have been studying.

Research Principle

Technology motivates students and provides for structured engagement.

Creating technology environments that heighten students' motivation to become independent readers and writers can increase their sense of competency (Kamil, Intrator, & Kim, 2000).

By giving students control of the screen and their progress, self-directed technology creates a sense of engagement and independence (Hasselbring, Lewis, Bausch, 2005).

System 44 Approach

System 44 harnesses the power of technology to motivate students and to provide for structured engagement. Students who are not drawn to print media but voluntarily spend hours on the computer can use a tool they value to master skills they need. The on-screen host provides feedback and encouragement that is private, nonjudgmental, and respectful of students, and the endless patience of the computer cannot be overemphasized as students have opportunities to try, try again. In order to keep track of their progress, students can access on-screen charts and printed reports, encouraging them to celebrate their successes and keep working toward their goals.

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