

The Scholastic logo, featuring a red rectangular background with a white book icon on the left and the word "SCHOLASTIC" in white, uppercase, sans-serif font on the right. The logo is positioned at the top center of the page, partially overlapping a large, golden ribbon graphic that runs vertically down the center.

SCHOLASTIC

# *SYSTEM 44*<sup>®</sup>

Three-Site Study:  
A Preliminary Evaluation in  
Indiana, Massachusetts,  
and Michigan

IMPACT STUDY

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## Acknowledgments

This research report was prepared by Stacey Storch Bracken, Ph.D., Statistical Consultant, and Lindsay Weil, Director of Research, Scholastic Research & Validation. It benefited from the contributions and insights of Melissa King, Research Communications Manager; Kristin DeVivo, Vice President; Scholastic Research and Validation; and Francie Alexander, Chief Academic Officer, Scholastic.

The Scholastic Research & Validation Department is committed to developing innovative educational products that are grounded in research and proven to work. We collaborate with school districts and third-party research organizations to conduct evaluations that provide useful information to help school leaders assess and advance school change and improvement. Scholastic believes strongly in a mixed-methods approach to our research, an approach that provides meaningful and contextualized information and results.

*System 44:*  
Three-Site Study: A Preliminary  
Evaluation in Indiana,  
Massachusetts, and Michigan

Prepared by:

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# Executive Summary

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During the 2009–2010 school year, Scholastic partnered with three public school districts in central Indiana, eastern Massachusetts, and southeastern Michigan to conduct a study of the impact of *System 44*, a phonics and foundational reading program, on the reading achievement of students in Grades 3–12. The primary purpose of the study was to examine growth in reading skills for students enrolled in *System 44*, as demonstrated by the Woodcock-Johnson III (WJ III), the Test of Word Reading Efficiency (TOWRE), *Scholastic Phonics Inventory* (SPI), and *Scholastic Reading Inventory* (SRI). A secondary purpose was to evaluate the performance of specific student groups: students with limited English proficiency and students receiving special education services.

Across the three districts, *System 44* was implemented in eight elementary schools, seven middle schools, and four high schools. Data were obtained from a total of 331 students in Grades 3–11 during the 2009–2010 school year. Findings from the study revealed that:

- Overall, *System 44* students across the three research sites showed significant improvements in their sight-word and non-word reading skills from fall to spring as measured by two standardized, norm-referenced tests: the TOWRE and the WJ III.
- In parallel with these findings, *System 44* students also demonstrated significant fall-to-spring growth in Word Reading Accuracy and Fluency, as measured by SPI.
- The percentage of students performing at the Developing Decoder or Advancing Decoder levels on SPI increased significantly from fall to spring, from 34% to 55%.
- In addition to word-level reading improvements, *System 44* students showed significant improvement in reading comprehension skills as measured by SRI, with an average Lexile® gain of 100L.
- When student subgroups were examined, students with limited English proficiency and students in special education showed statistically significant gains on WJ III, SPI, and SRI.

# Introduction

To become proficient readers, students must be able to recognize the words of a text with adequate ease and accuracy. In principle, students should have mastered foundational word-reading skills by second grade. However, data show that many students who struggle with reading in Grade 3 or higher still lack these critical skills. For example, recent studies of older struggling readers reveal that more than 60% of the students have difficulty with the basics of decoding and sight-word identification (Hock, Deshler, Marquis, & Brasseur, 2005; Hock et al., 2009; Leach, Scarborough, & Rescorla, 2003; Torgesen et al., 2007).

Evidence has shown that typical public school interventions for struggling readers merely stabilize, rather than advance or normalize, reading skills (Torgesen et al. 2001). In fact, resource room or special education placements often result in no gains or even declines in reading ability (Bentum & Aaron, 2003; as reported in Torgesen et al., 2001). The reason such interventions have not been shown to be successful may lie in the type of instruction these children are typically receiving. The reading instruction being delivered in general and special education classrooms is often neither explicit nor differentiated, two key characteristics of effective reading instruction (Vaughn, Levy, Coleman, & Bos, 2002). Furthermore, even when special education reading instruction produces positive outcomes, it may not be enough to accelerate reading growth, suggesting that students with reading disabilities are unlikely to catch up to their peers (Torgesen et al., 2001).

Research on reading development has identified several factors critical to helping older struggling readers gain the foundational skills they need. Phonological awareness has been shown to be one important predictor of reading acquisition (Adams, 1990; Adams, Treiman, & Pressley, 1998; Jenkins, Fuchs, van den Broek, Espin, & Deno, 2003). That is, in order to read, students must be able to hear and manipulate individual speech sounds and connect those sounds to letters and words. Thus, the majority of older struggling readers need systematic, explicit instruction and individualized practice in phonemic awareness, syllable strategies, structural analysis, and morphological word analysis. These struggling students should learn decoding and spelling as reciprocal skills, and should build spelling memory through knowledge of syllable patterns, word structure, and morphemes.

In addition, sight word knowledge is an important element of reading fluency (Wagner, 2008). Older struggling readers need support in building a large vocabulary of sight words that can be recognized automatically. The recognition of and knowledge about the meaning of words is an essential factor underlying reading proficiency and comprehension in older struggling readers (Boardman et al., 2008).

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Along with the critical foundational skills of phonemic awareness and sight word knowledge, there is a strong connection between motivation and reading achievement (Guthrie, Wigfield, & Perencevich, 2004; Torgesen et al., 2007). Current theory suggests that students who are motivated and interested in the material they read will learn more (Vogel et al., 2006). The use of technology, including computer and video games, can be a powerful way to motivate students in the classroom because it allows them access to an engaging and self-directed learning environment (Hasselbring, Lewis, Bausch, 2005). Vogel's meta-analysis illustrated that video games can foster greater cognitive outcomes and more positive student attitudes toward learning than other traditional instructional methods. Similarly, Jenkins (2005) argued that games can further accelerate student achievement by engaging students, lowering the threat of failure, linking learning to goals and rules, and utilizing multimodal media. Research has also demonstrated the importance of customizing learning tasks to both the needs and interests of each student and providing individualized feedback and guidance (Wise et al., 2007). This is particularly critical when a computer is providing the instruction.

Thus, research has shown the importance of addressing both the unique academic and motivational needs of older struggling readers. An instructional system that supports the development of phonemic awareness and phonics skills in a motivating, high-interest context appropriate for older students is essential.

In response to this critical need to foster word-reading skills in older struggling readers, Scholastic developed *System 44* for the most challenged readers in Grades 3-12. This foundational phonics and reading program is the result of collaboration between Dr. Marilyn Adams, author of the acclaimed work *Beginning to Read: Thinking and Learning About Print*, and Dr. Ted Hasselbring, whose seminal work with the Cognition and Technology Group at Vanderbilt University led to the development of the FASTT model underlying the *System 44* software. Intentionally metacognitive, *System 44* helps students understand that the English language is a finite system of 44 sounds and 26 letters that can be mastered.

# Overview of System 44

*System 44* combines research-based phonics instruction for older students with state-of-the-art adaptive technology and age-appropriate, supportive fiction and nonfiction texts. There are four technology strands within the program. The Code provides direct instruction and intensive, adaptive practice in letter-sound correspondence. Word Strategies lessons provide instruction and practice in syllable strategies and word analysis. Sight Words lessons focus on building automatic recognition of the highest-utility sight words. Finally, the Success strand provides exposure to background information and vocabulary to help students better access a rigorous text passage that tests students' skills and reading comprehension.

In addition to the software, *System 44* also includes classroom materials for teachers and students. The *Teaching Guide* provides explicit decoding and word strategy lessons that teachers can use for Small-Group Instruction. Specific guidance for teachers in working with English-language learners and special education students is also provided in the *Teaching Guide*. Students can practice and apply the skills learned in the software in a number of ways, including the *System 44* Library (a collection of high-interest, age-appropriate texts and audiobooks), the Decodable Digest (decodable text passages to practice applying decoding skills), and the *44Book* (a reading/writing guide which contains engaging activities, such as word building, word sorts, and puzzles). In addition, the Scholastic Achievement Manager provides teachers with reports to monitor student progress on the software, diagnose instructional needs, and aid in planning classroom instruction.

*System 44* was designed to be used daily for 45–60 minutes, with students spending a minimum of twenty minutes on the software and involved in modeled/independent reading. In the 45–60 minute instructional model, the class begins with a five- to ten-minute Whole-Group Introduction in which the teacher leads a short warm-up activity to engage students and build phonemic awareness and phonics skills. After the introduction, students split into two groups; one group rotates to the *System 44* Instructional Software, while the other group works with the teacher in Small-Group Instruction or Modeled & Independent Reading practice.

## Whole-Group Introduction

During the first five to ten minutes, before students break into small groups, the teacher welcomes students, creates a community of learners, and sets the day's purpose. The ultimate goal of the Whole-Group Introduction is to motivate students through word-play games and activities that introduce and review broad phonics concepts as well as foundational reading, vocabulary, and writing skills.

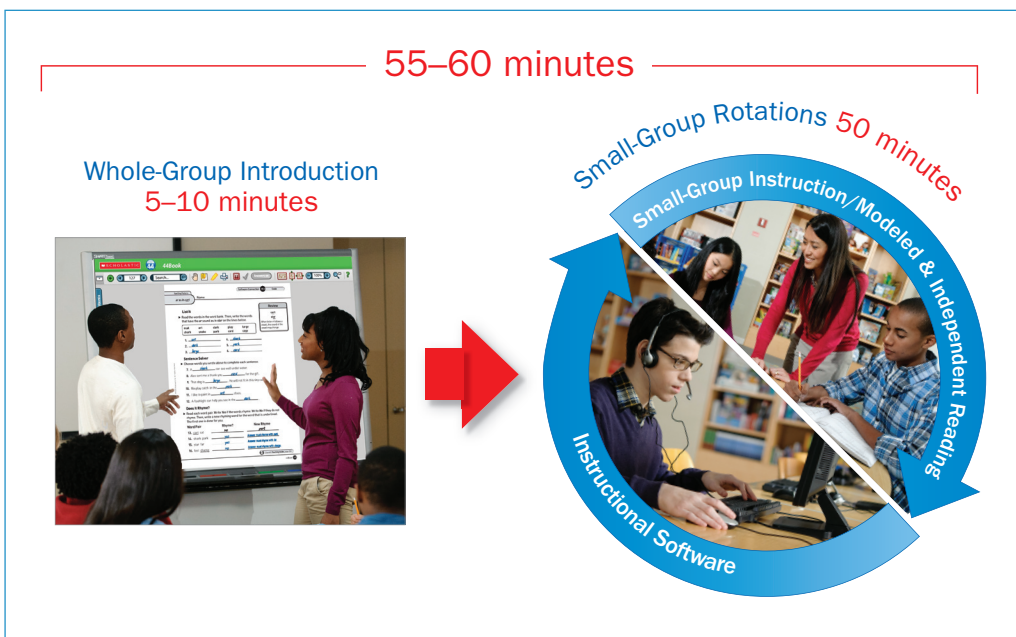
## Small-Group Introduction and Independent Practice

Teachers present targeted, Small-Group Instruction informed by data and reports coming from the software. During this time, teachers use the *System 44 Teaching Guide* lessons to build phonics, phonemic awareness, academic vocabulary, and word strategy skills. They also provide direct instruction and practice with the *44Book*, Flip Chart, Word Building Kit, Sound & Articulation DVD, *System 44 Decodable Digest*, and *System 44 Library and Audiobooks*.

## Instructional Software

Students work independently on the software and receive intensive, individualized instruction and skills practice.

### System 44 Instructional Model



# Study Overview

## Research Questions

The primary purpose of this study was to examine growth in word-level reading and comprehension skills for students enrolled in *System 44*, as demonstrated by the Woodcock-Johnson III (WJ III), the Test of Word Reading Efficiency (TOWRE), *Scholastic Phonics Inventory* (SPI), and *Scholastic Reading Inventory* (SRI). A secondary purpose was to evaluate the performance of specific student groups: students with limited English proficiency and students receiving special education services. The evaluation focused on three research questions:

- 1. How did students progress through the *System 44* software over the course of one year?**
- 2. Did students in *System 44* classrooms demonstrate significant improvements in word-reading accuracy, fluency, and comprehension as measured by the WJ III, TOWRE, SPI, and SRI?**
- 3. Did performance on measures of word-reading accuracy and fluency vary by special education classification and English-language proficiency?**

## Setting and Sample

During the 2009–2010 school year, three public school districts in central Indiana, eastern Massachusetts, and southeastern Michigan piloted *System 44* for their most challenged readers who had not yet mastered basic phonics and decoding skills. Total student enrollment in these three urban districts varied from 12,220 to 16,536 students, including a diverse mix of English learners and special education students.

Across the three districts, a total of 331 students participated in *System 44* during the 2009–2010 school year. Students in Grades 3–11 were selected to participate based on a number of criteria, including:

- performing poorly on their state reading measure, either the MCAS (Massachusetts), ISTEP+ (Indiana), or MEAP (Michigan);
- scoring below 400 Lexile on *Scholastic Reading Inventory* (a secondary measure of reading comprehension); or
- exhibiting difficulty with word-reading skills on *Scholastic Phonics Inventory*.

Across the three districts, the *System 44* program was used in eight elementary schools, seven middle schools, and four high schools.

All students in this study sample were enrolled in *System 44*, and had data from the fall and spring SPI administrations. Additionally, students in this sample had valid test data from the fall and spring administrations of the Woodcock-Johnson III and the TOWRE. A subsample of students also had data from *Scholastic Reading Inventory* (SRI).

Table 1 presents the characteristics of students in this study sample, as provided by the districts. As shown in the table below, Asian/Pacific Islanders (the majority of Burmese descent) and Hispanic students comprised 56% of the sample. Approximately half of all students were of limited English proficiency, and nearly half were students receiving special education services. The *System 44* students were slightly more likely to be male (59%), and only 15% were in high school.

**Table 1**  
**System 44 Study Students, 2009–2010**  
**Demographic and Academic Characteristics of Students Included in the Study (N=331)**

	Number of Students	Percent of Students
<b>All</b>	331	100%
<b>CONTRIBUTING DISTRICT</b>		
District 1 (MA)	52	16%
District 2 (IN)	159	48%
District 3 (MI)	120	36%
<b>SCHOOL LEVEL</b>		
Elementary School (3rd–5th)	134	40%
Middle School (6th–8th)	148	45%
High School (9th–12th)	49	15%
<b>GENDER</b>		
Male	194	59%
Female	137	41%
<b>ETHNICITY</b>		
Asian/Pacific Islander	99	30%
Hispanic	88	26%
African American	62	19%
Caucasian	59	18%
Biracial/Multiracial/Other	23	7%
<b>Limited English Proficiency (LEP)</b>	170	51%
<b>Special Education (SPED)</b>	152	46%

# Study Overview (cont'd.)

Table 2 presents this same information by study site.

<b>Table 2</b> <b>System 44 Study Students, 2009–2010</b> <b>Demographic and Academic Characteristics of Students by Site (N=331)</b>			
	District 1 (MA)	District 2 (IN)	District 3 (MI)
<b>Total Number of Students</b>	52	159	120
<b>SCHOOL LEVEL</b>			
Elementary School (3rd–5th)	17%	21%	77%
Middle School (6th–8th)	56%	58%	21%
High School (9th–12th)	27%	21%	2%
<b>GENDER</b>			
Male	73%	57%	54%
Female	27%	43%	46%
<b>ETHNICITY</b>			
Asian/Pacific Islander	0%	60%	2%
Hispanic	90%	12%	18%
African American	2%	8%	40%
Caucasian	0%	18%	25%
Biracial/Multiracial/Other	8%	2%	15%
<b>Limited English Proficiency (LEP)</b>	58%	73%	20%
<b>Special Education (SPED)</b>	48%	31%	65%

## Measures

To address the central research questions, evaluators obtained data from the Woodcock-Johnson III Tests of Achievement (WJ III), the Test of Word Reading Efficiency (TOWRE), *Scholastic Phonics Inventory* (SPI), and *Scholastic Reading Inventory* (SRI), as well as *System 44 Program Data*.

**Woodcock-Johnson III (WJ III):** The nationally normed Letter-Word Identification and Word Attack subtests from the WJ III were administered in fall 2009 and spring 2010. Letter-Word Identification measures word identification skills, starting with the identification of letters and progressing to increasingly more difficult words. Word Attack measures proficiency in applying phonic and structural analysis skills to the pronunciation of unfamiliar printed words. The Basic Reading Skills cluster score is based on the combined performance from these two subtests.

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**Test of Word Reading Efficiency (TOWRE):** The nationally normed Sight Word Efficiency and Phonemic Decoding Efficiency subtests from the TOWRE were administered in November 2009 and in May 2010. The Sight Word subtest requires recognizing familiar words as whole units or sight words, and the Phonemic Decoding Efficiency subtest measures students' ability to sound out non-words. The TOWRE Total Word Reading Efficiency score is based on the combined performance on the two subtests.

**Scholastic Phonics Inventory (SPI):** SPI is a computer-based test that is designed to measure fluency for two word-level reading skills: phonological decoding and sight word reading. Phonological decoding fluency is assessed by the speed and accuracy with which pronounceable nonwords are decoded. Sight word fluency is assessed by the speed and accuracy with which high-frequency words are read. An overall accuracy and fluency score reflects the performance for these two skills. Based on the scores, the student is placed into one of four performance levels: Pre-Decoder, Beginning Decoder, Developing Decoder, or Advancing Decoder. SPI contains three equivalent forms for screening and progress monitoring purposes. The software selects the appropriate form automatically; each time a student logs in to take a test, the software delivers a new form. In this study, SPI was administered in October/November 2009 and in April/May 2010.

**Scholastic Reading Inventory (SRI):** SRI measures reading comprehension by focusing on the following skills: identifying details in a passage, identifying cause-and-effect relationships and sequence of events, drawing conclusions, and making comparisons and generalizations. During test administration, the computer adapts the test continually, according to student responses. Performance on SRI is reported as a Lexile (L) scale measure. The higher a student's measure, the more challenging material that student is likely to be able to read and understand. Scores can range from Beginning Reader (less than 100L) to Graduate School Reader (1500L). SRI was administered two times in order to measure growth in reading comprehension over time. The pretest was given in November 2009 and the posttest in May 2010.

**System 44 Program Data:** The *System 44* program covers 160 phonics Topics (individual lessons, such as "Consonants b, r" "Short o," and "Digraph th"). Approximately 6–8 Topics are grouped together into a Series; there are 25 Series in the program. The *System 44* program collects and provides progress information for each student regarding the total number of Topics completed and the highest Series reached, as well as usage data, including the total number of software sessions completed and the total time (hours) spent on the software.

# Study Overview (cont'd.)

## Program Implementation

Implementation of *System 44* varied across the three districts.

In District 1 (MA), *System 44* was implemented using a 60-minute standalone model five days a week, with the exception of one high school classroom that was limited to a 50-minute model. In District 2 (IN), *System 44* was implemented using a standalone model, for 50 to 120 minutes each day. In District 3 (MI), all classrooms implemented a standalone model of *System 44*, varying from 60 to 90 minutes based on school schedule.

All classrooms followed the recommended rotational model, including a whole-group introduction in which the teacher led a short warm-up activity to engage students and build phonemic awareness and phonics skills, followed by two 20 to 25 minute rotations on the instructional software or in teacher-led Small-Group Instruction.

# Results

This section presents the quantitative results of the analysis of student outcome data.

## Research Question #1:

### How did students progress through the *System 44* software over the course of one year?

The first research question concerned the way in which students progressed through the content of the *System 44* software over the course of the school year. Table 3 shows program progress and use by school level and subgroup. Four measures are included in the table. The first two, number of topics completed and highest series reached, represent measures of student progress through the *System 44* software. The latter two, total number of sessions and total time, represent measures of program use or dosage.

	<b>N</b>	<b>Mean Number of Topics Completed</b> (out of a possible 160)	<b>Mean Series Reached at Program End</b> (out of a possible 25)	<b>Mean Number of Sessions</b>	<b>Mean Total Time</b> (hours)
<b>SCHOOL LEVEL</b>					
Elementary School (3rd–5th)	134	54	8	80	22 hrs
Middle School (6th–8th)	148	83	13	113	26 hrs
High School (9th–12th)	49	68	10	88	30 hrs
<b>SPECIFIC GROUP</b>					
LEP	170	85	13	108	30 hrs
SPED	152	51	8	86	21 hrs
<b>OVERALL</b>	331	69	11	96	25 hrs

As shown in Table 3, students spent approximately 25 total hours on the *System 44* software during an average of 96 sessions. Students completed 69 topics (out of 160 possible), or about 43% of the program content, and reached, on average, Series 11, not quite the halfway point in the program. Only 11% (35 students) completed all 160 topics in the program. The data on program progress suggests that students generally covered the topics of consonants and short vowels, consonant blends and digraphs, and some long vowels, but had yet to reach topics of long vowel digraphs, r-controlled and variant vowels, and application of word strategies such as prefixes, suffixes, and roots.<sup>1</sup>

<sup>1</sup>The *System 44* software was updated in late spring 2010 to improve student pacing through the program. This software update improved pacing through the software by enabling all students to take Fast Track Assessments after each Topic and move past lessons in which they are already proficient.

# Results (cont'd.)

## Research Question #2:

**Did students in *System 44* classrooms demonstrate significant improvements in word-reading accuracy, fluency, and comprehension as measured by the WJ III, TOWRE, SPI, and SRI?**

### WJ III AND TOWRE

*System 44* students were administered two nationally-normed, standardized measures of reading ability. Students were pretested and posttested on the WJ III Tests of Achievement, specifically the Word Attack and Letter-Word Identification subtests, which together yield a Basic Reading Skills cluster score. In addition, students were pre- and post-tested on the Sight Word Efficiency and Phonemic Decoding Efficiency subtests of the TOWRE, which combine to produce an overall Total Word Reading Efficiency score.

Table 4 shows the pretest and posttest scores and gains on the WJ III and TOWRE for the full *System 44* sample.

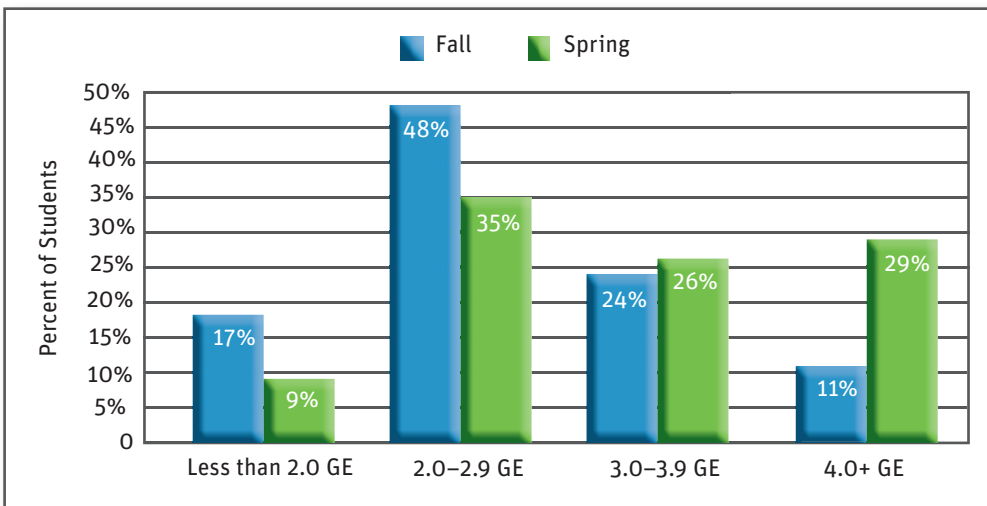
Table 4 System 44 Students (N=331) WJ III and TOWRE Growth for the Full Sample					
	Mean Fall Standard Score	Mean Spring Standard Score	Mean Change in Standard Score	Percent of Sample with Positive Change	Significance
<b>WJ III</b>					
Basic Reading Skills	74 (4 <sup>th</sup> PR)	78 (7 <sup>th</sup> PR)	+4	77%	t=7.79 p=.00
Word Attack	81 (10 <sup>th</sup> PR)	84 (14 <sup>th</sup> PR)	+3	66%	t=5.77 p=.00
Letter-Word ID	72 (3 <sup>rd</sup> PR)	77 (6 <sup>th</sup> PR)	+5	66%	t=8.17 p=.00
<b>TOWRE</b>					
Total Word Reading Efficiency	74 (4 <sup>th</sup> PR)	75 (5 <sup>th</sup> PR)	+1	59%	t=3.66 p=.00
Sight Word Efficiency	77 (6 <sup>th</sup> PR)	80 (5 <sup>th</sup> PR)	+2	73%	t=7.61 p=.00
Phonetic Decoding Efficiency	79 (8 <sup>th</sup> PR)	79 (8 <sup>th</sup> PR)	0	53%	No change

Note. TOWRE scores were calculated using an average of performance on Forms A and B. Standard scores in table are rounded to nearest integer. PR = percentile rank.

Results show that *System 44* students made significant gains on the Word Attack and Letter-Word Identification subtests of the WJ III, as well as on the overall Basic Reading Skills cluster. Gains ranged from 3 to 5 standard score points. Students also made a significant gain on the Sight Word Efficiency subtest of the TOWRE, as well as in their overall Total Word Reading Efficiency. There was no change in average score on the Phonemic Decoding Efficiency subtest.

In addition, as shown in Graph 1, the overall sample showed significant improvement in their Grade Equivalent scores, as measured by the WJ III Basic Reading Skills cluster. Whereas only 11% of students were performing at or above a 4.0 grade equivalent in the Fall, this percentage nearly tripled, to 29%, in the Spring.

**Graph 1**  
**System 44 Students (N=331)**  
**Change in Grade Equivalents (GE) on the WJ III—Basic Reading Skills Cluster**



*Note.* The increase in the percentage of students performing at the 4.0 GE level or above is significant ( $t=7.51, p=.00$ ).

# Results (cont'd.)

Fall and spring performances on the WJ III and TOWRE were further analyzed by school level (Table 5).

Test	Elementary School (n=134)			Middle School (n=148)			High School (n=49)		
	Mean Fall Std. Score	Mean Spring Std. Score	Mean Change Std. Score	Mean Fall Std. Score	Mean Spring Std. Score	Mean Change Std. Score	Mean Fall Std. Score	Mean Spring Std. Score	Mean Change Std. Score
WJ III Basic Reading Skills	84 (14 <sup>th</sup> PR)	85 (16 <sup>th</sup> PR)	+2	71 (3 <sup>rd</sup> PR)	76 (5 <sup>th</sup> PR)	+6	57 (<1 <sup>st</sup> PR)	65 (1 <sup>st</sup> PR)	+7
TOWRE Total Word Reading	81 (10 <sup>th</sup> PR)	84 (14 <sup>th</sup> PR)	+3	72 (3 <sup>rd</sup> PR)	71 (3 <sup>rd</sup> PR)	-1	59 (<1 <sup>st</sup> PR)	63 (1 <sup>st</sup> PR)	+4

*Note.* Elementary: WJIII,  $t=2.73$ ,  $p=.01$ ; TOWRE,  $t=4.62$ ,  $p=.00$ . Middle: WJIII,  $t=6.21$ ,  $p=.00$ ; TOWRE: n/s. High: WJIII,  $t=4.31$ ,  $p=.00$ ; TOWRE,  $t=4.99$ ,  $p=.00$ . TOWRE scores were calculated using an average of performance on Forms A and B. Standard scores in table are rounded to nearest integer. PR=percentile rank.

Fall testing indicated that while all of the *System 44* students were performing at a relatively low level relative to same-age peers (based on national norms on the WJ III and TOWRE), the struggling readers in elementary school were, on average, performing at a higher percentile rank than were the middle school struggling readers, who themselves were performing at a higher level than the high school struggling readers. That is, initial (fall) performance on the two tests indicated that the elementary students placed somewhere between the 10th and 14th percentiles, the middle school students were generally at the 3rd percentile, and the high school students were performing below the 1st percentile, indicating severe reading skill deficits.

As shown in Table 5, all three school levels evidenced significant gains on the WJ III Basic Reading Skills cluster from Fall to Spring. The elementary and high school students also evidenced significant gains on the TOWRE Total Word Reading Efficiency. The high school students, who had the lowest initial scores, evidenced the greatest gains on these measures.

## **SCHOLASTIC PHONICS INVENTORY (SPI)**

SPI measures word-reading accuracy and fluency, providing scores for sight words, non-words, and overall. Table 6 shows the mean fall and spring SPI scores, along with fall-to-spring gains in these measures, for the full *System 44* study sample.

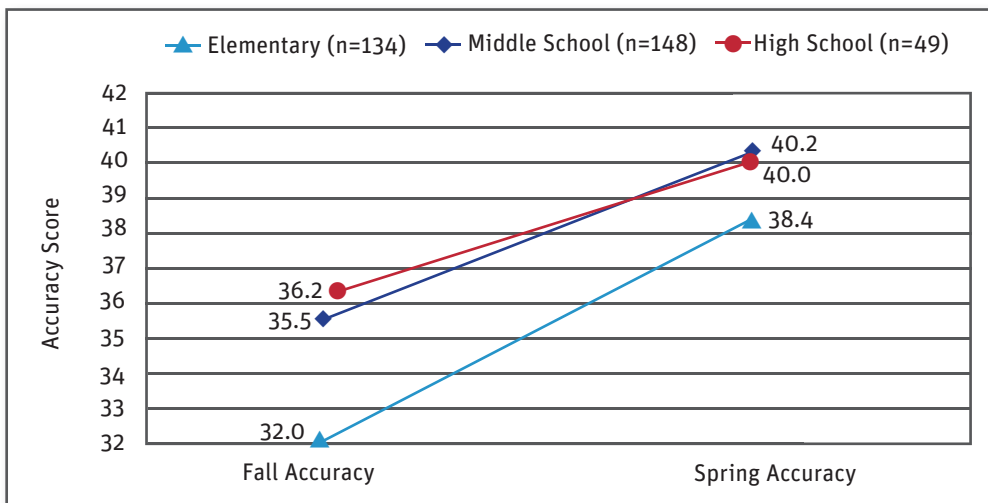
**Table 6**  
**System 44 Students (N=331)**  
**Fall and Spring SPI Scores and Gains**

	Fall Score	Spring Score	Fall-to-Spring Gain	Significance
<b>Total Accuracy</b>	34.2	39.5	5.3	t=17.56, p=.00
<b>Sight Word Accuracy</b>	16.7	19.7	3.0	t=15.32, p=.00
<b>Nonword Accuracy</b>	17.5	19.8	2.3	t=11.39, p=.00
<b>Total Fluency</b>	9.8	13.1	3.3	t=10.25, p=.00
<b>Sight Word Fluency</b>	4.6	7.1	2.4	t=12.59, p=.00
<b>Nonword Fluency</b>	5.1	6.0	0.9	t=4.34, p=.00

As shown in Table 6, fall-to-spring gains on all of the six SPI measures were statistically significant. Students averaged a gain of 5.3 points in Total Accuracy and 3.3 points in Total Fluency. The effect sizes for growth were educationally meaningful and of medium magnitude (Total Accuracy,  $d=.66$ ; Total Fluency,  $d=.41$ ).<sup>2</sup> Gains for sight word items generally outpaced gains for nonword items.

Graphs 2 and 3 provide gains in Total Accuracy and Total Fluency by school level.

**Graph 2**  
**System 44 Students (N=331)**  
**Fall-to-Spring SPI Gains in Total Accuracy, by School Level**

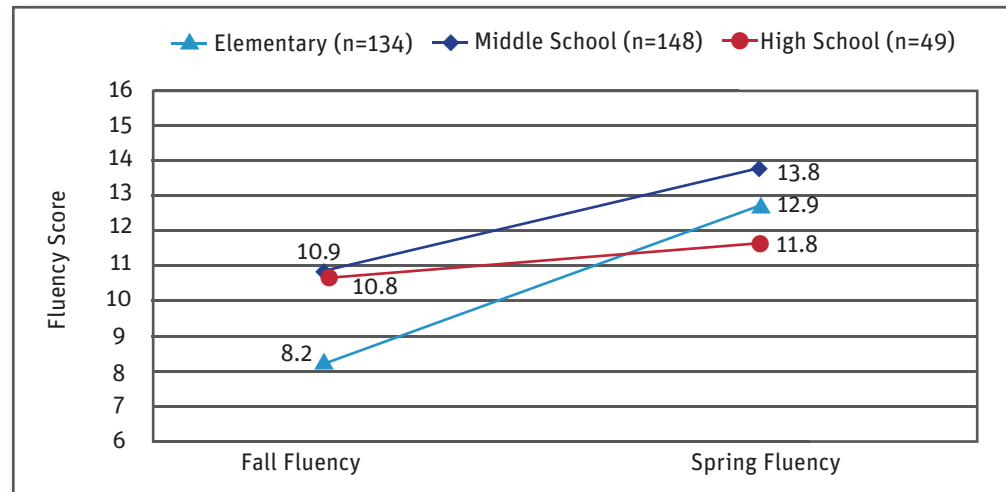


*Note.* Gains were significant for elementary students ( $t=13.29, p=.00$ ); middle school students ( $t=10.42, p=.00$ ); and high school students ( $t=6.21, p=.00$ ).

<sup>2</sup> Effect size is a way of quantifying achievement differences between two groups. Effect sizes range from 0–1. Typically, an effect size of 0 to 0.4 is considered low, 0.4 to 0.7 is considered moderate, and 0.8 to 1.0 is considered high.

# Results (cont'd.)

**Graph 3**  
**System 44 Students (N=331)**  
**Fall-to-Spring SPI Gains in Total Fluency, by School Level**



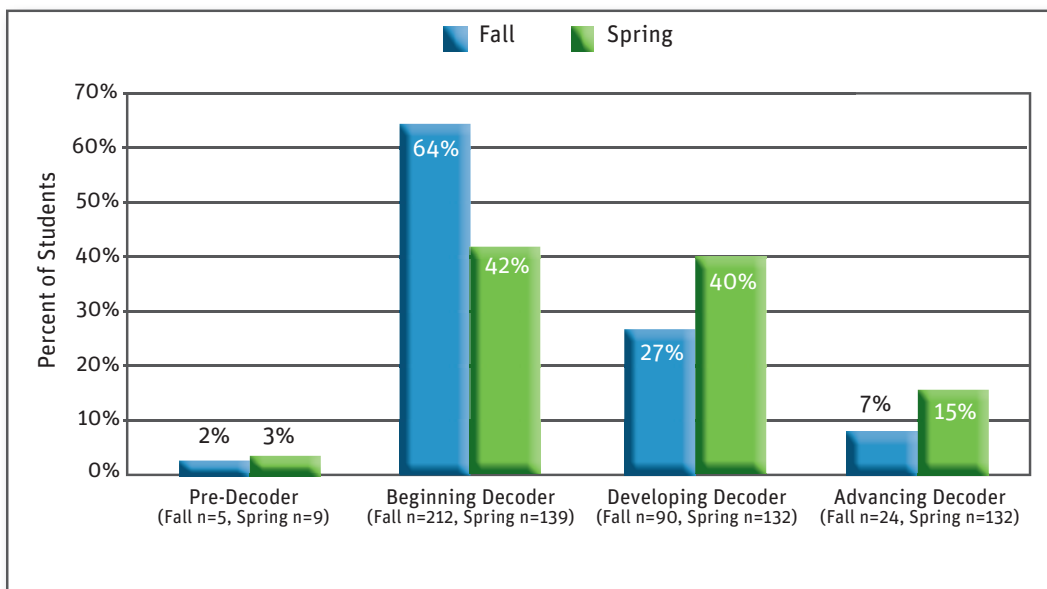
*Note.* Gains were significant for elementary students ( $t=9.04, p=.00$ ) and middle school students ( $t=5.86, p=.00$ ).

As Graphs 2 and 3 illustrate, the greatest gains in Total Accuracy and Total Fluency were made by the elementary school students. The elementary students recorded gains of 6.4 in Accuracy and 4.7 in Fluency. Importantly, all school levels made significant gains in Accuracy across the school year. Elementary and middle school students made significant gains in Fluency as well. The high school students made a small gain in Fluency. However, this gain was not statistically significant.<sup>3</sup>

In addition to providing raw scores on Accuracy and Fluency measures, the SPI categorizes students into one of four Decoding Status levels according to their overall SPI performance: Pre-Decoder, Beginning Decoder, Developing Decoder, or Advancing Decoder. Graph 4 shows the distribution of study students among these four categories at the fall and spring time points.

<sup>3</sup>It is important to note that the high school sample in this report included a larger percentage of special education students (63%) than did the elementary (45%) or middle school (41%) samples. This population of special education students tended to exhibit smaller fluency gains.

**Graph 4**  
**System 44 Students (N=331)**  
**Fall-to-Spring Changes in SPI Decoding Status**



Note. The increase in percentage of students performing at the Developing or Advancing Decoder levels is significant ( $t=7.16, p=.00$ ).

As Graph 4 shows, the percentage of Developing and Advancing Decoders (the two highest levels) increased, while the percentage of Beginning Decoders decreased between the fall and spring SPI administrations. The percentage of students at the Developing or Advancing Decoder levels rose significantly from only one-third (34%) in the fall to more than half (55%) in the spring ( $t=7.16, p=.00$ ), indicating that significantly more students were demonstrating improved decoding skills at the end of the school year. Overall, one-third (34%) of students improved one or more decoding status levels on SPI from fall to spring.

### **SCHOLASTIC READING INVENTORY (SRI)**

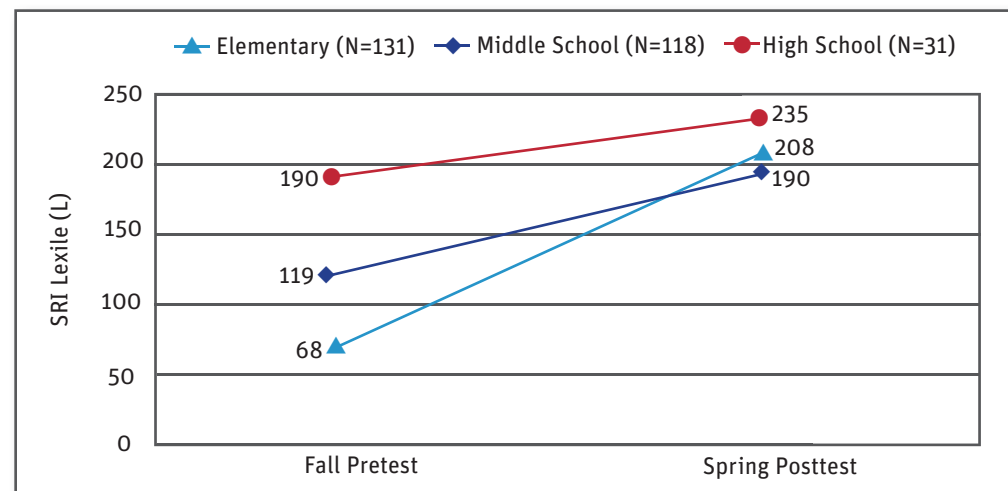
Data from SRI was also evaluated as a measure of growth in reading comprehension skills. Two-hundred-eighty students (85% of the original sample) had data from two SRI tests, taken a minimum of 90 days apart. The mean number of days between the two SRI tests for these 280 students was 193 days, or approximately 6.5 months.

Initial SRI Lexile levels indicated that in general, regardless of grade level, the students in this study were reading below a first grade level. The overall sample improved from an initial Lexile of 103L to 204L, a significant gain of 100L ( $t=10.85, p=.00$ ). Almost two-thirds, 63%, of study students recorded gains in their Lexile measures.

# Results (cont'd.)

Graph 5 shows the SRI growth by school level for these *System 44* students.

**Graph 5**  
**System 44 Students (N=280)**  
**SRI Scores and Growth, by School Level**



*Note.* Gains were significant for the elementary school students ( $t=9.72$ ,  $p=.00$ ); middle school students ( $t=5.55$ ,  $p=.00$ ); and high school students ( $t=1.93$ ,  $t=.06$ ).

As shown in Graph 5, both the elementary (3rd–5th grade) and middle school (6th–8th grade) levels demonstrated significant gains in their Lexile level across the school year, gains of 140L and 71L respectively. The high school gain approached significance. As seen with SPI, the greatest improvement was shown by the elementary school students.

## Research Question #3:

### Did performance on measures of word-reading accuracy and fluency vary by special education classification and English-language proficiency?

To address the third research question, the performance of special education students and English language learners was examined.

#### SPECIAL EDUCATION STUDENTS

This sample contained 152 students who were classified as receiving special education (SPED) services. SPED students were classified as learning disabled, speech and language impaired, health impaired, hearing impaired, autistic, orthopedic impaired, emotionally impaired, or as

having a mild cognitive disability. More than half (56%) of the SPED students were classified as learning disabled. Table 7 shows the characteristics of the special education sample.

**Table 7**  
**System 44 Special Education Students (N=152)**  
**Characteristics of Students by Site**

	<b>ALL</b>	<b>District 1 (MA)</b>	<b>District 2 (IN)</b>	<b>District 3 (MI)</b>
<b>Number of SPED Students</b>	152	25	49	78
<b>Primary Classification</b>				
Learning Disabled	56%	76%	63%	45%
Speech/Language Impairment	16%	4%	0%	29%
Other Health Impairment	11%	4%	12%	13%
Mild Cognitive Disability	9%	8%	14%	6%
Autism	3%	0%	6%	1%
Physical Handicap	2%	4%	0%	3%
Deaf/Hard of Hearing	1%	0%	4%	0%
Emotional Impairment	1%	4%	0%	1%
Traumatic Brain Injury	1%	0%	0%	1%
<b>Ethnicity</b>				
Asian/Pacific Islander	1%	0%	0%	1%
Hispanic	29%	96%	14%	17%
African American	30%	4%	24%	41%
Caucasian	32%	0%	57%	26%
Biracial/Multiracial/Other	9%	0%	4%	15%
<b>Language Status</b>				
Limited-English Proficient	17%	28%	12%	17%

# Results (cont'd.)

Results showed that special education students demonstrated significant gains on the Woodcock-Johnson Basic Reading Skills cluster and the TOWRE Total (Table 8). The SPED students averaged a gain of 2 standard score points on both the WJ III and TOWRE, from fall to spring.

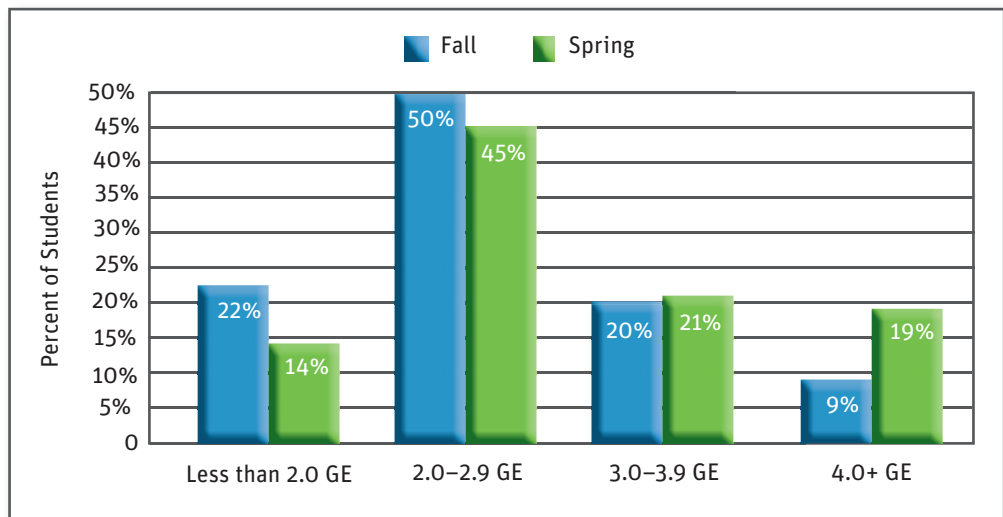
Table 8 System 44 Special Education Students (N=152) WJ III and TOWRE Growth				
	Fall Standard Score	Spring Standard Score	Mean Change in Standard Score	Significance
WJ III Basic Reading Skills	70 (2 <sup>nd</sup> PR)	73 (4 <sup>th</sup> PR)	+2	t=4.71 p=.00
TOWRE Total Word Reading Efficiency	68 (2 <sup>nd</sup> PR)	70 (4 <sup>th</sup> PR)	+2	t=4.10 p=.00

PR=percentile rank

Moreover, as shown in Graph 6, the special education students showed significant improvement in their grade equivalent scores, as measured by the WJ III Basic Reading Skills cluster. Whereas only 9% of the SPED students were performing at or above a 4.0 grade equivalent in the fall, this percentage more than doubled, to 19%, in the spring.

**Graph 6**

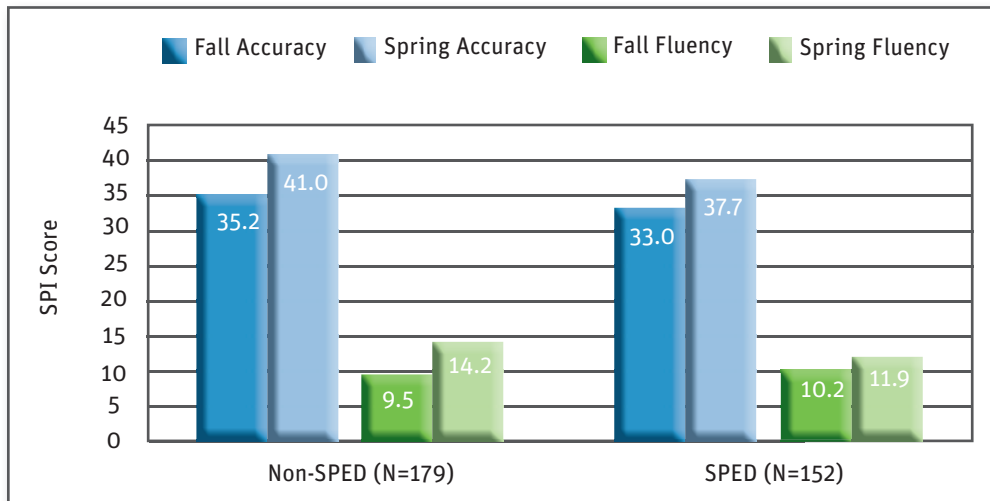
**System 44 Special Education Students (N=152)  
Change in Grade Equivalents (GE) on the WJ III—Basic Reading Skills Cluster**



Note. The increase in the percentage of students performing at the 4.0 GE level or above is significant (t=3.54, p=.00).

Graph 7 shows the performance of special education students on the SPI Accuracy and Fluency measures, as compared with their non-special education peers.

**Graph 7**  
**System 44 Students (N=331)**  
**SPI Performance, by Special Education Status**



Results showed that the SPED students made significant fall-to-spring gains in both Accuracy (blue bars;  $t=10.26$ ,  $p=.00$ ), and Fluency (green bars;  $t=4.51$ ,  $p=.00$ ). The improvements in accuracy observed among the SPED students were not significantly different than that made by the non-SPED students; however, the SPED students did demonstrate a significantly smaller Fluency gain than did their non-SPED peers ( $F=21.39$ ,  $p=.00$ ).

For the subsample of 125 SPED students with valid pretest and posttest SRI scores, results demonstrated a significant fall-to-spring Lexile gain of 86L (Table 9).

Table 9 System 44 Special Education Students (N=125) SRI Growth				
	Fall Lexile	Spring Lexile	Mean Lexile Gain	Significance
SRI	146L	232L	86L	$t=6.07$ $p=.00$

*Note.* Students were included in the SRI analyses if they had two SRI test dates, a minimum of 90 days apart.

## Results (cont'd.)

Finally, results were also broken down by special education classification. Table 10 shows the fall-to-spring gains for each SPED classification. Please note that inferences regarding the gains of groups with fewer than 20 students cannot be made, and such gains are presented for descriptive purposes only.

<b>Table 10</b> <b>System 44 Special Education Students (N=152)</b> <b>Fall-to-Spring Gains by Classification</b>					
Primary Classification	N	SPI Accuracy Gain	SPI Fluency Gain	WJ III Basic Reading Skills Gain	TOWRE Total Gain
Learning Disabled	85	4.9	1.6	3	2
Speech/Language Impairment	24	3.8	1.6	2	3
Other Health Impairment	17	7.2	1.5	-1	1
Mild Cognitive Disability	14	2.5	2.3	3	0
Autism	4	4.0	3.5	5	-2
Physical Handicap	3	2.0	1.0	-1	1
Deaf/Hard of Hearing	2	8.0	1.5	-2	0
Emotional Impairment	2	-1.0	6.0	-5	6
Traumatic Brain Injury	1	8.0	2.0	3	1

### LIMITED ENGLISH PROFICIENT STUDENTS

One-hundred-seventy students in this sample were classified as limited English proficient (LEP). Table 11 shows the characteristics of the limited English proficient students.

<b>Table 11</b> <b>System 44 Limited English Proficient Students (N=170)</b> <b>Characteristics of Students by Site</b>				
	ALL	District 1 (MA)	District 2 (IN)	District 3 (MI)
<b>Number of LEP Students</b>	170	30	116	24
<b>Ethnicity</b>				
Asian/Pacific Islander	57%	0%	83%	4%
Hispanic	34%	87%	16%	58%
African American	2%	0%	1%	8%
Caucasian	4%	0%	1%	25%
Biracial/Multiracial/Other	3%	13%	0%	4%
<b>SPED Status</b>				
SPED	15%	23%	5%	54%

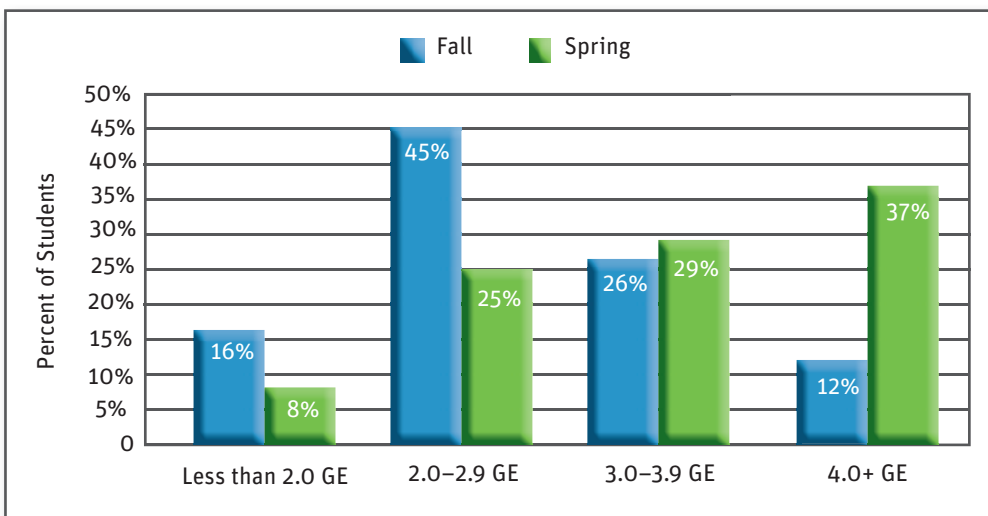
Results showed that limited English proficient students demonstrated a significant fall-to-spring gain of 7 standard score points on the Woodcock-Johnson Basic Reading Skills cluster (Table 12). No significant change was recorded on the TOWRE Total Word Reading Efficiency.

Table 12 System 44 Limited English Proficient Students (N=170) WJ III Growth				
	Fall Standard Score	Spring Standard Score	Mean Change in Standard Score	Significance
WJ III Basic Reading Skills	73 (4 <sup>th</sup> PR)	80 (9 <sup>th</sup> PR)	+7	t=7.41 p=.00

PR=percentile rank

As shown in Graph 8, the limited English proficient students also showed significant improvement in their grade equivalent scores, as measured by the WJ III Basic Reading Skills cluster. Although only 12% of the LEP students were performing at or above a 4.0 grade equivalent in the fall, more than one-third of the sample (37%) were doing so in the spring.

**Graph 8**  
**System 44 Limited English Proficient Students (N=170)**  
**Change in Grade Equivalents (GE) on the WJ III—Basic Reading Skills Cluster**

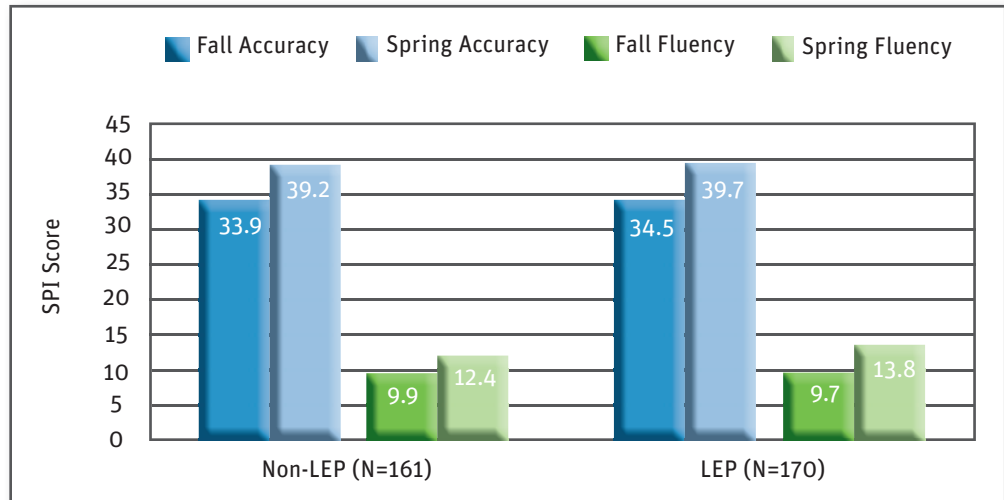


Note. The increase in the percentage of students performing at the 4.0 GE level or above is significant (t=6.61, p=.00).

# Results (cont'd.)

Graph 9 shows the performance of the limited English proficient students on the Accuracy and Fluency measures of SPI, as compared with their English proficient peers.

**Graph 9**  
**System 44 Students (N=331)**  
**SPI Performance, by Language Status**



The limited English proficient students made significant fall-to-spring gains in both Accuracy (blue bars;  $t=12.97$ ,  $p=.00$ ), and Fluency (green bars;  $t=8.20$ ,  $p=.00$ ). Interestingly, the LEP students demonstrated a significantly greater gain in fluency than did their non-LEP peers ( $F=6.43$ ,  $p=.01$ ), gaining an average of more than 4 points on the SPI Fluency measure.

Finally, for the 143 LEP students with valid SRI pretest and posttest scores, results showed a significant fall-to-spring Lexile gain of 93L (Table 13).

Table 13 System 44 Limited English Proficient Students (N=143) SRI Growth				
	Fall Lexile	Spring Lexile	Mean Lexile Gain	Significance
SRI	55L	148L	93L	$t=8.16$ $p=.00$

*Note.* Students were included in the SRI analyses if they had two SRI test dates, a minimum of 90 days apart.

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## SUMMARY OF RESULTS

The results of this three-site study of 331 students enrolled in the *System 44* program revealed a number of important findings, summarized below:

- Overall, *System 44* students showed significant improvements in their sight-word and non-word reading skills from fall to spring as measured by two standardized, normed tests: the TOWRE and the WJ III.
- *System 44* students showed significant fall-to-spring growth in Reading Accuracy and Reading Fluency, as measured by *Scholastic Phonics Inventory* (SPI).
- Overall, one-third of students improved one or more decoding levels, as measured by SPI. There was a significant increase in the number of students performing at the Developing or Advancing Decoder levels from fall to spring (an increase from 34% to 55%).
- *System 44* students showed significant improvements in their reading comprehension skills as measured by SRI. The average Lexile gain was 100L.
- When student subgroups were examined, students who were receiving special education services or who were limited English proficient showed statistically significant improvements on SPI. In addition, SPED and LEP students showed significant improvements in the WJ III and SRI.

# Discussion

This research study evaluated whether students with severe reading skill deficits who participated in the *System 44* program for one year improved their accuracy and fluency skills. The results of this study indicate that the *System 44* students did improve in reading achievement.

Findings indicated that struggling readers using *System 44* demonstrated significant improvements on two nationally normed, standardized measures of reading skills, the WJ III and TOWRE. These results were further supported by significant gains in reading accuracy and fluency from fall to spring on SPI.

Positive outcomes were upheld when the results were analyzed for two key student groups: *System 44* students receiving Special Education (SPED) services and those who were classified as limited English proficient (LEP). Both groups showed significant gains in reading accuracy and fluency on the SPI, as well as significant gains on the WJ III and SRI.

It is important to note that subsequent to this study, in Spring 2010, the *System 44* software was updated to accelerate the pace by which *System 44* students move through the program. Among other things, this new software update creates a new uniform pacing setting that enables ALL students to take the Fast Track Assessment after every Topic and move past lessons in which they are already proficient. It is expected that these new enhancements will stimulate even greater gains in student's word-level reading skills. Additional research comparing the growth in reading skills for struggling readers who participate in *System 44* to those who do not will provide further evidence of the program's impact.

While this was not a randomized controlled study, this preliminary research suggests that *System 44* is having a positive impact on student reading achievement. These findings are particularly important when viewed in light of existing research on the flat (or even negative) growth trajectories of students with reading disabilities. Any intervention aimed at struggling older readers must produce not just statistically significant growth, but practically significant growth as well, improvement that will begin to reduce the gap between them and their grade-level peers. While carefully acknowledging that the reading skills of this sample of older students are still well below average and in need of continued intervention, the significant improvement observed on the WJ III, in particular, represents a promising sign that the explicit, systematic, differentiated instruction provided by *System 44* effectively moves these students closer to grade-level expectations.

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