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WHY ELS WORKS

Its Scientific, Theoretical, and Evaluation Research Base

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Why ELS® Works:

Its Scientific, Theoretical, and Evaluation Research Base

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April 2005

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Executive Summary

Chapter I: Introduction

Given the emphasis in No Child Left Behind (NCLB) on "scientifically-based research" (SBR), Creative Education Institute (CEI), publisher of Essential Learning Systems (ELS), commissioned this research report for its potential and current school partners. The legal definition of SBR was explored, concluding with interpretations from various sources, including the United States Department of Education. It is clear that a program is considered to be scientifically-based if its components have been verified through empirical research to be effective in improving student achievement.

ELS was, therefore, deconstructed to identify its components—the lesson phases, lesson models, content/skills, and instructional strategies used in each of the program's 30+ tasks. Also listed were the program features that support effective implementation. The resulting list of topics became the research agenda that shaped the study to determine the scientific base for ELS and also its theoretical and program evaluation research base.

Chapter II: ELS as a Therapeutic Intervention for Struggling Learners

CEI has throughout its existence focused on the academic needs of "people with educational differences," kindergarten through adult, including not only those with learning disabilities, but also those who are limited-English proficient, those who have difficulties resulting from economic disadvantages, and those who have acquired difficulties due to inadequate or inappropriate instruction. What is known from research is that the chief cause of learning difficulties and disabilities is faulty sensory processing. CEI's treatment for the correction of those problems is ELS, which includes in all its instructional tasks the use of multi-sensory processing. Research from many diverse disciplines, including education, cognitive psychology, neurobiology, linguistics, optometry, and others verify the effectiveness of this type of treatment to move knowledge and skill into long-term memory. The study as a whole illustrates that ELS is, therefore, a "therapeutic intervention" because it provides diagnosis; individual prescriptions; scientifically-based treatment, differentiated according to the diagnosis; research-based content instructional strategies, and implementation support; careful monitoring of progress; and improved performance.

Chapter III: ELS Program Tasks, Lesson Phases, Lesson Models, and Content

Each of the 30+ tasks was coded to identify which phase of lessons it included—instruction, practice (guided or independent), or assessment. Then each task was coded to identify whether it used one or more steps in research-based direct instruction, mastery learning, or one-to-one tutoring lesson models. Individual studies on these models, as well as citations from research syntheses, verified that the use of such

models with at-risk learners was not only appropriate, but also predictive of gains in student learning.

To examine the appropriateness of the content and skills taught in ELS, the meta-analysis of hundreds of studies published in 2000 by the National Reading Panel (NRP) was closely studied. Not only did this report verify that ELS includes the five critical components of early reading identified by the NRP, but it also found substantial research evidence in support of other content included in the overall ELS program, such as the importance of basic writing skills.

Chapter IV: ELS Instructional Strategies

The research literature verifying the effects of several instructional strategies was also reviewed. Scores of studies were identified, for instance, on the efficacy of computer-assisted instruction in general, but also specifically in its power to develop fluency and vocabulary, as well as other specific areas. Scientific research verified, in addition, that the care that CEI has taken to use very simple, uncluttered screens in lesson presentation was exactly the right decision, not only for learning-disabled students, but also many others with difficulties in visual processing and focusing.

Individualized and differentiated instruction are other major strengths of ELS, according to the many studies reviewed. These strategies are realized with the use of computer-assisted instruction, to a great extent, and through the individually prescribed treatments using multi-sensory processing. No two learners in an ELS lab, regardless of its size, will necessarily be working on the same lesson, and if so, not with the same lesson parameters.

Scientific research was identified, as well, in support of the other key instructional strategies: active engagement and time-on-task, chunking or clustering, and practice or repetition. It is important to note that none of the lesson phases, models, content, skills, or instructional strategies operates in isolation from all the others. They are intricately intertwined and interrelated in their implementation, just as curriculum, instruction, and assessment become one in the regular classroom.

A major part of ELS's power is its inclusion of diverse kinds of assessments that are used to diagnose strengths and weaknesses, to identify deficits in student knowledge, for placement into the program at the appropriate level, to monitor progress on a daily and periodic base, and for pre-test to post-test gains for student evaluation, as well as program evaluation. The dynamic nature of the formative assessments allow the teacher/facilitator to ensure that the computer-delivered instruction is truly "informed" or "data-driven" on a daily basis. The scientific research behind the effectiveness of such uses of assessments and their data to improve student performance verified these strategies in ELS.

Chapter V: Additional ELS Program Features

There is growing evidence that many educational innovations declared by some to be failures perhaps were not. They just were never implemented according to the design and/or according to the professional development provided. CEI staff, aware of that research, focuses its entire service program on supporting implementation. It includes, therefore, several components to support student motivation to learn and parental

involvement. Major resources are devoted to ongoing professional development with follow-up coaching; online, telephone, and e-mail support; newsletters and webpage information that help to form a network among users; and technical support to keep the software enhanced, updated, and operational. An Implementation Toolkit is provided as a handbook for the principal or other instructional leader with information, suggestions, and encouragements to lead to an effective implementation. Scientific research, again, supports these and similar strategies.

Chapter VI: Additional Research Evidence of ELS Effectiveness

Educators rely not only on scientific evidence for decision-making, but also evidence of success in other districts or schools, so, although not strictly scientific, a case study of the Brazosport Independent School District's multiple-year experience in using ELS for its struggling readers was included. District officials point out that Brazosport did a number of things at once, so the success they demonstrated in closing their achievement gaps was not solely due to their implementation of ELS, but, in their words, "it was a primary player."

Finally, an analysis of many years of pre- and post-test scores collected by CEI from several different subgroups in thousands of labs across the country show that, on average, learners gain almost two years for a year of instruction. This kind of growth is exemplary of what an accelerated program should be. More than a third of the participating students gain two years or more.

Chapter VII: Summary and Conclusions

In conclusion, ELS is a scientifically-based program, not in just some of its components, but all—in its employment of multi-sensory processing as treatment for learners with difficulties or disabilities; in its use of lesson phases and models; in the content and skill included in its curriculum; in its inclusion of computer-assisted instruction and other instructional strategies; and in its rich use of assessments to provide data for diagnosis, monitoring, and program evaluation, but also, importantly, to inform the day-to-day instructional decisions to keep the program truly individualized and differentiated. The ELS program is further scientifically-based in its implementation of support programs: motivation for learning; parental involvement; and professional development with follow-up coaching.

On the basis of the scientific evidence provided, ELS is determined to be an effective therapeutic intervention for struggling learners. Its use with a diversity of students at risk of school failure predicts accelerated growth in student achievement, enabling those students, then, to access successfully the grade-level state standards and to perform at the proficient level.

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VI. Additional Research Evidence of ELS Effectiveness

Why ELS Works:
Its Scientific, Theoretical, and Evaluation Research Base

Chapter I: Introduction

> "…one of the most frequently mentioned enjoyable activities the world over is reading." —Csikszentmihalyi, 1991, p. 49

When Creative Education Institute's (CEI) designers of Essential Learning Systems (ELS) came together in the mid-1980s to write the program, they knew a great deal about how to teach struggling readers, both from research and from experience. They were prescient enough to include critical content, instructional strategies, assessments, and program features that were not, at that time, totally validated through scientific research. The evidence that their identification of good practice was indeed ahead of its time did not come until several years later. They used the research they had in the design phase, according to documents in the CEI archives, and they drew on their experience as good teachers of students who experienced reading difficulties or disabilities. They also engaged themselves in a continuous improvement cycle, observing successful labs, interviewing the best lab facilitators, correlating the kinds of activities that had a positive relationship with student outcomes, collecting pre- and post-test data, and then making recommendations to schools about how to implement effectively.

Little has changed in ELS content and instruction since its original design—except that ongoing technological advances have enabled the program to grow increasingly user-friendly, to incorporate more engaging graphics and activities, to be net-workable, and to add several supplemental features requested by users, such as the electronic placement test. Important program features, such as lesson sequences, have been added to provide more individualization and more opportunities for practice, as well as to address differences in learner needs. Other ancillary features have been added, such as Quick Tales, CEI Journal, and, recently, the WAC (web-based activity center). Constant feedback from educators and students, as well as current research, provides, according to CEI staff, the information needed for ongoing and continuous improvement. "But the genius of the original design has stayed in place," according to Al Hoekstra, an early employee of the company. CEI is not aware of another educational software program that has 18 years of development and refinement behind it.

The basic content of ELS is not the only thing that has remained constant. "Creative Education Institute has not deviated since its founding," states its President and Chief Executive Officer, Mr. Terry Irwin, "from its mission to support the learning of people with educational differences." The CEI mission is known by all employees and is part of the introduction of each professional development session: "To produce innovative learning solutions that enable

people with educational differences to achieve academic, social, and professional success."

Today other terms may define "people with educational differences" or "struggling learners." Recent research now reveals much information about the sources and diversity of those learning differences. In general, they are those learners identified as subgroups in the No Child Left Behind (NCLB) Act of 2001: learners who are economically disadvantaged, English-language learners, special education students, and children from racial and ethnic minorities [NCLB, 2001, Sec. 1111(a)(2)(C)].

Purpose of This Study

The purpose of this study is to provide educators with the scientifically-based and other research evidence in which ELS is solidly grounded—at the (a) program, (b) content, (c) instructional strategy, and (d) program feature levels. Given that NCLB stated more than 100 times in the Act that intervention programs and strategies must be based on "scientifically-based research," it is a responsibility of every program and strategy provider to provide that evidence. A McREL (Mid-continent Research for Education and Learning) official stated that "The onus for branding a product or program 'scientifically based' should rest first on the developers and distributors of the programs themselves" (p. 9). One is reminded of a comment by Pogrow (1996): that expecting teachers to do all of their instructional planning, to gather and vet and refine their own materials entirely on their own is akin to expecting actors to not just act, but write all their own scripts (p. 663).

What is presented, then, in this study is the *scientific, theoretical, and evaluation research evidence* that schools and districts need for assurance that ELS as a whole and its individual strategies and practices will result in improved reading achievement for a broad group of learners who have previously struggled with reading. Positive results—gains in student achievement—are the gold standard, of course. Southwest Educational Development (b) explained on their website that "When reading programs are tested, the outcome that is measured is student achievement, and any program that increases student achievement significantly is considered to be an effective, research-based program." The therapeutic nature of ELS, the knowledge and skills taught in the individual tasks, as well as the instructional strategies and other program features, have all been studied under experimental conditions, and the ELS program reflects the positive findings of many, many empirical studies, as well as additional theoretical and program evaluation studies.

Definitions of Scientifically-Based Research (SBR)

Scientifically-based research is not a new educational term, but the attention it is currently receiving is certainly new due to its emphasis in NCLB (also in the

Individuals with Disabilities Education Improvement Act of 2004, formerly IDEA) and other programs designed for at-risk learners). Not only does the federal law now mandate that teaching strategies and programs be "scientifically-based," but it also defines in Title I what that is for reading:

> The term "scientifically based reading research" means research that (A) applies rigorous, systematic, and objective procedures to obtain valid knowledge relevant to reading development, reading instruction, and reading difficulties, and (B) includes research that (i) employs systematic, empirical methods that draw on observation or experiment; (ii) involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn; (iii) relies on measurements or observational methods that provide valid data across evaluators and observers and across multiple measurements and observations; and (iv) has been accepted by a peer-reviewed journal or approved by a panel of independent experts through a comparably rigorous, objective, and scientific review [NCLB, 2001, Sec. 1208(6)].

In the guidance provided by the United States Department of Education (2003) on how to identify effective programs, they noted: "By intervention, we mean an education *practice, strategy, curriculum, or program"* [emphasis added].
In another NCLB guidance document (Jan. 7, 2004) published by the United States Department of Education, SBR was defined as follows:

> Strategies grounded in scientifically based research are those that have demonstrated over time and in varied settings, an effectiveness that is documented by high-quality educational research. . . . For example, scientifically based research has shown that explicit instruction in (1) phonemic awareness, (2) phonics, (3) vocabulary development, (4) reading fluency, and (5) reading comprehension is effective in teaching reading to students in grades K-3. *Strategies that apply this research in a classroom setting would be grounded in scientifically based research* [emphasis added] (p. 10).

In other words, a school or district may choose programs that include in their design the practices or strategies that have been verified as effective through scientifically-based research. Shaywitz (2003), one of the leading authorities on teaching reading to learning disabled students, said that she recommends "total 'off-the-shelf' comprehensive programs rather than so-called eclectic ones that are stitched together by a child's teacher" (p. 262). She further noted that "programs are constantly changing, but the instructional principles remain the same" (p. 263). ELS is the kind of evidence-based comprehensive program that she advocates.

Shanahan (2002) interpreted "research based" in a similar way. He suggested that the term should be "reserved for those instances when there was strong

evidence that a particular type of instruction intervention—although not necessarily this particular version of it—had worked in the past" (p. 12). He then explained:

> For example, we know that many studies have demonstrated better reading achievement results when phonics instruction was provided. If someone were to design a phonics program—a program untested, but similar to those that have been studied—this would be research based. This term would mean that programs similar to this one have worked successfully in experimental studies, and that this program was designed on the basis of that research (p. 12).

Deshler (2003) added another dimension to the meaning of "research based." He stated the following:

> I would submit that unless a so-called "scientifically-based practice" has been shown to get results in a scaled-up and sustained fashion, it can't be said to be scientifically based. … Unless an innovation has been proven to be effective and usable in front line settings, researchers cannot legitimately claim their innovation to be scientifically-based (p. 1).

ELS also meets this criterion since it has been effectively used for almost two decades in literally thousands of schools and other educational institutions for learners from kindergarten through adult and in almost 20 states.

Stanovich and Stanovich (2003) further defined SBR in describing the ways in which educators might gather evidence that new reforms (whether purchased or designed in-house) are effective:

- Demonstrated student achievement in formal testing situations implemented by the teacher, school district, or state;
- Published findings of research-based evidence that the instructional methods being used by the teachers lead to student achievement; or
- Proof of reason-based practice that converges with a research-based consensus in the scientific literature. This type of justification of educational practice becomes important when direct evidence may be lacking. . . but there is a theoretical link to research-based evidence that can be traced (p. 1).

The reader will find all three kinds of evidence documented throughout this paper.

An example of how one can infer scientific evidence is provided by Mercer and Mercer (2005). They described, for instance, several available research-based remedial programs, along with their features (pp. 304-306). Since these programs are proven to improve student learning, one can infer that similarly-

constructed programs with similar research groundings are also scientifically-based, although not directly studied.

Mercer and Mercer (2005) also offered reassurances about the quantity of available research findings related to the teaching of reading, especially for those with special needs:

> The substantial reading research generated and examined during the 1990s result in a significant body of information about how to identify and teach children with learning problems to read successfully. Thus, educators enter the new millennium armed with more evidence-based information about reading instruction than has ever been available. It behooves educators to use these expanded findings about teaching reading to make the best practices in reading instruction available to the nation's teachers and students (pp. 282-283).

The Mercers' comprehensive explanation and synthesis of salient findings, along with many other new publications since the passage of NCLB in 2002, makes that research easily and efficiently accessible to both regular and special educators.

This study will, first, through research and theory cited, establish ELS as a therapeutic intervention. It will, then, document the scientific evidence behind the ELS content, instructional strategies, and program support features, as well as provide case study and program evaluation evidence from the thousands of schools which have implemented it successfully for a variety of struggling readers.

Programs Requiring SBR

All programs and strategies funded through federal dollars, including those that are grant-funded, and, increasingly, through state initiatives or grants, must reflect SBR. ELS is correlated in this section with the major federal programs serving low-performing, economically disadvantaged, limited-English proficient, and special education learners:

- Title IA Schoolwide Projects and Targeted Assistance Programs
- Title IB Reading First Programs
- Title IF Comprehensive School Reform Programs
- Title III Programs for Limited-English Proficiency Students
- Programs for Section 504 Disabilities
- IDEA Programs for Special Education

A brief description of each program, information about the population(s) it serves, and references to CEI correlations with the program mandates are provided in the following table:

Table 1: ELS Correlations with Federal Program Mandates

Federal Program	ELS Correlations
Title IA—Serves educationally disadvantaged. Accountability requires adequate yearly progress (AYP) on state assessments and on high school graduation rates for all students and for subgroups (racial/ethnic, limited-English proficient, economically disadvantaged, and special education).	Available on website: www.ceilearning.com: *Correlations to Texas Standards (TEKS) for English Language Arts and Reading, K-12* *A Results-based Assessment of Essential Learning Systems' Correlation to the National Dropout Prevention Center/Network* Available in Appendix A: *ELS Correlation to Title I Schoolwide Project Requirements* Available to school partners: *ELS Implementation Toolkit (with model School Improvement Plan)*
Title IB Reading First—Serves K-3 students in schools with low achievement in reading and/or high poverty rates. Many states require DIBELS assessments for Reading First. Many states require pre- and post-tests in K-3 reading initiatives.	Available on website: *A Results-based Assessment of Essential Learning Systems' Correlation to the National Reading Panel Guidelines* *ELS Correlation to DIBELS* *ELS Correlation to Texas Primary Reading Inventory (TPRI)* See also Appendix C.
Title IF Comprehensive School Reform—Grants to low-performing schools to provide supplemental funding for schoolwide change. Many states are now prioritizing these funds to schools failing to achieve AYP under Title IA.	Available in Appendix B: *ELS Correlation to Comprehensive School Reform Requirements*
Title III Limited-English Proficient Learners.—Accountability requires LEPs to take state assessments in English their fourth year in US schools. States must also test every LEP-identified student annually to measure growth in English proficiency. Schools and districts are also held accountable for increasing numbers of LEPs exiting the program within four years.	Available on website: *A Results-based Assessment of Essential Learning Systems' Correlation to Limited-English Proficient Instruction*
Section 504 Disabilities—Schools must provide support and accommodations to children not eligible for special education, but with disabilities that affect learning.	Available on website: *A Results-based Assessment of Essential Learning Systems' Correlation to the Texas Education Agency's Dyslexia Instructional Guidelines*
IDEA Special Education—Accountability requirements include not only those in IDEA, but also in NCLB. Only 3% of a district's or school's proficient scores on the state assessments can result from scores on alternative state assessments.	Available on website: *Essential Learning Systems and Its Correlation to a Successful Intervention for Left Occipitotemporal Systems*

This section of the study shows the alignment of ELS with major federal programs that serve struggling readers and which require evidence of SBR in order to be funded. Such correlations position ELS within the larger picture of a school's curriculum and instruction programs, as well as within NCLB, IDEA, and other program mandates. They also are a secondary level of research evidence. If a federal or state program mandate or standard is in itself research-based, then it follows that ELS is also research-based to the extent it correlates with the mandate or standard. For instance, a Texas Education Agency publication (2001b) stated that "TEKS. . . is a comprehensive research-based instructional program for grades K-12" (p. 5). To the degree that ELS is correlated with TEKS, its content is research-based, using those criteria.

Methodology

Just as effective teachers strive to incorporate as many scientifically-based teaching strategies as possible into any single lesson and throughout the school year, so did CEI in designing and developing ELS, according to archived notes and reports written by those with involvement in the initial development and subsequent enhancements. The first step taken in documenting the scientifically-based evidence that grounds the program, therefore, was to "deconstruct" the program; that is, each task was analyzed to determine, first, whether it is instruction, practice, and/or assessment and the nature of the lesson model (whether direct instruction, mastery learning, or one-to-one tutoring). Then each task's specific content was determined, as well as the specific instructional strategies employed. The assessments used to determine diagnosis, program placement, progress, and mastery were listed. And, finally, other program features that support effective implementation were enumerated. Only then did the work begin to identify whether empirical/scientific research validated each component of ELS.

CEI offices are filled with files, notebooks, and shelves of books on reading research—some dating back to its founding; some produced by members of the staff; some written by graduate students from area universities and presented to CEI; some produced by individual schools or districts; some pulled from the Internet; and some reproduced from research journals, old and new. Staff members, according to Jennifer German, professional services director, eagerly consume these studies, for they serve as a constant validation of their work. They help, as well, to answer educators' questions about individual students in their labs, and they guide thinking about future development. Research for this study started in the archives to document SBR for CEI's customers and clients by gathering all those documents and books. Additional searches were conducted in libraries and using the Internet to identify potential empirical studies that would predict the effectiveness of ELS. Special efforts were expended to review as many recent studies as possible.

Education research journals were not the sole source for studies. Also included were studies from medicine, biology, neurobiology, neuropsychology, cognitive science, psychology, linguistics, optometry, and other relevant disciplines. Reading well is a complex skill; therefore, understanding it well clearly requires the study of diverse experts. Caine and Caine (1991) stated it this way: "Teaching to the human brain…, based on a real understanding of how the brain works, elevates teaching into a challenging field requiring the finest minds and intellects" (p. ix).

This research documentation begins with the findings of those who have identified struggling readers, whether with difficulties or dysfunctions, and the characteristics of effective interventions that teach those learners how to read. Chapter II will include an alignment of ELS with these characteristics, document the urgency of early intervention, and explain why ELS is considered by CEI and by its users to be a "therapeutic intervention." SBR findings are documented in subsequent chapters that verify the predicted effectiveness of each task, each instructional strategy, and each program feature. In some cases, in addition to empirical studies, theoretical research and program evaluation research were included—if those studies were deemed to be important and consistent. Every one of the major tasks, strategies, and features of ELS is grounded in findings from multiple, credible scientific studies.

In many ways this study is similar to the one performed by the National Reading Panel. A thorough search was conducted for the relevant research, and then it was summarized and synthesized. A statistical meta-analysis with calculations of effect sizes was not performed, for those had already been done by the researchers. In fact, although the bibliography includes scores of individual studies, the study relied most heavily on the syntheses already conducted by such reputable researchers as the National Research Council, the National Reading Panel, the Education Research Service, Robert Marzano and colleagues at McREL, Southwest Education Development Lab, Mercer and Mercer, and others. The studies quoted in their research syntheses are not included in this study's bibliography since all the experiments in the meta-analyses were not inspected directly. Only the sources directly cited are included. The bibliographies of each of the cited sources are recommended to the reader as additional evidence.

The reader will find in subsequent chapters a pattern of organization. First, the topic is defined, and, second, the way that the particular topic is descriptive of some feature of ELS is explained or described. A decision, then, was made to use some direct quotations from the research findings in this explanation, but, for the most part, the research findings are listed in tables without any filtering on the part of the writers. The reader can review the cumulative evidence and make his or her own inferences about their meaning and application, assuring as much objectivity as possible in this presentation.

It was also felt that it was important to include a wide sampling of the available research and then to invite the reader to use the specific sources and findings that they deem most important and relevant. Different districts and different states have varying expectations about how to document the scientifically based research behind an intervention program, so the flexibility of this document will make it easier for educators to cite what they determine will best meet their needs in making a decision to include ELS as an at-risk intervention in the school/district or in justifying to funding sources a prior implementation of ELS.

Description of ELS and Its Uses

Essential Learning Systems (ELS) is a supplementary, therapeutic intervention program for students who are experiencing difficulty in learning to read, regardless of age, from kindergarten to adult, and regardless of the cause of the difficulty or disability, whether inherited, acquired, or environmental. Given the diversity of learners that the program serves, it is individualized and differentiated in many ways and therefore has a complex architecture. Subsequent chapters of this study describe its many components and strategies.

ELS is not in itself a comprehensive reading program. It is, rather, as its name states, a learning system, so it correlates with curriculum standards only at the basic skill level. ELS teaches the prerequisite knowledge and skills that make it possible for all those learners currently failing to learn what they need to know to access the grade-level curriculum and to meet the standards of proficiency on state examinations. CEI program experts point out that “It makes no sense for a school to require students to be tutored on grade-level curriculum standards if they cannot read fluently and with comprehension.” It is important to attend to “first things first.”

Elementary schools typically adopt ELS as a prevention program used by all or most students at an early grade level (K-2), or as an intervention for struggling students, usually those in the NCLB subgroups, beginning in mid-year of grade 1 and in the upper grades. Because at least 10 percent of middle and high school students cannot yet read fluently or comprehend well, those levels of schools use ELS for targeted groups of students. Many place all beginning-level English-language learners in the program to assist them in acquiring the sounds of English phonemes, to teach vocabulary and spelling, and to build fluency and comprehension skills. They also use ELS labs to satisfy the requirements of dyslexia programs and to assist low-performing special education students in acquiring more advanced reading and learning skills so that they can perform with success in general education classes.

ELS is also used in intensive instruction programs—summer school and after school programs to accelerate reading achievement, for example; Tier 2 and/or Tier 3 interventions in Reading First programs; tutoring for students who fail state assessments; second periods of literacy development for targeted students, and

so forth. Another use is not only including ELS instruction and assessment components as part of a special education student's individual education plan (IEP), but also to satisfy new state mandates for individual academic improvement plans for students failing any portion of the state assessments. Arkansas is a good example. The law there requires a "Student Academic Improvement Plan" for any failing student (see Chapter IV—Individualized and Differentiated Instruction). Florida passed similar legislation in 2004.

ELS includes approximately 30 unique tasks. Each ELS lesson includes a set of primary tasks called SHARE (See, Hear, And REspond) tasks, which provide an introduction to the lesson. ELS includes 26 different lesson sets that allow the teacher/facilitator to provide individualized, differentiated instruction for each student, via computer-assisted instruction. By monitoring and analyzing trends in student performance, the teacher/facilitator can select a set of lessons that will ensure that a student completes the SHARE tasks at the beginning of each class period, providing repetition and reinforcement as necessary. Once the student completes the SHARE tasks, he or she spends the remainder of the class period working on supporting tasks that provide guided and independent practice of the concepts and skills presented in SHARE. Assessment activities are included to provide ongoing data for the teacher/facilitator to use for decision-making. Detailed descriptions of the individual tasks, as well as supplementary and resource materials, are provided in the *ELS Teacher's Manual.*

Organization and Overview of the Study

Chapter I introduced the study, along with its purpose. Various definitions of SBR were provided, along with the list of major federal programs that mandate the use of SBR in program selection and implementation and ELS's correlations to those mandates. The study's methodology and a brief description of ELS and its uses were described.

Chapter II discusses the uniqueness of ELS as a therapeutic intervention. It begins with the research on who is at risk of reading failure and the differences and similarities between learning difficulties and learning disabilities. Also included is a section that recognizes the urgency in the research literature for early identification and treatment of learning problems. The characteristics of effective literacy interventions are discussed next, along with an analysis of ELS's alignment with those research-based characteristics.

The Chapter II focus is on the major cause of learning problems—difficulties/ disabilities involving sensory processing. The findings from neurobiology and cognitive science research (among other disciplines) are included to determine the basis for therapeutic interventions. A major section is devoted to a review of the literature on multi-sensory processing as a therapeutic strategy and its use in ELS. The chapter concludes with the rationale for ELS as a "therapeutic intervention."

Chapter III begins with an explanation of the role of the teacher/facilitator in an ELS lab and her importance to the overall success of the program's implementation. ELS is then "deconstructed" and coded as to its lesson phases, lesson models, and lesson content. The SBR for each component is provided, including summaries of the critically important findings of the National Reading Panel. This chapter concludes with the SBR on comprehensive literacy program characteristics and ELS's correlation to them and a discussion of the role of ELS in the 3-Tier Reading Model used for Reading First in many states.

Chapter IV moves to an examination of the instructional strategies used in ELS. The first section provides the SBR behind the use of computer-assisted instruction. Because screen design is critically important in success with students with difficulties or disabilities, a section on the SBR behind computer screen design is included. Other powerful ELS strategies were then described and examined: individualized and differentiated instruction, active engagement and time on task, chunking or clustering, and repetition or practice. The chapter ends with a description of the various ELS assessments and their use, the role of SBR under-girding corrective feedback provided to students, the use of assessment data to inform instructional decisions, and the value of student engagement in self-assessment.

ELS incorporates many other program support features that also are grounded in SBR. They are described and analyzed in Chapter V. Motivation/recognition, parental involvement, professional development with follow-up coaching, and implementation support are included.

In Chapter VI are two major sections. The first is a case study of the Brazosport Independent School District, including the results they garnered in closing the achievement gap, in part through their implementation of ELS. The second section is devoted to an analysis of pre- and post-test scores for diverse student populations participating in ELS labs over multiple years.

Conclusions and insights are provided in Chapter VII.

The end of the study includes the bibliography and appendices.

Chapter II: ELS as a Therapeutic Intervention for Struggling Learners

". . . the usual remediation strategies we employ when kids fail to meet statewide testing requirements are to give them the same unbelievably bad instruction they got in the first place, only in much larger quantities with must greater intensity. This is what we call the louder and slower approach." –Elmore, 2002, p. 7

The Challenge of Teaching Struggling Learners

In Chapter I there was a reference to the NCLB subgroups (economically disadvantaged, English-language learners, special education, and racial/ethnic minorities) as a definition of those who "struggle" or are at risk of school failure. The research cited in the table below references those same categories, including adolescent and adult learners, not just children, who also need interventions.

Table 2: Who Is at Risk?

Researcher(s)	Findings/Conclusions
Hart & Risley, 1995, p. 193	"We learned from the longitudinal data that the problem of skill differences among children at the time of school entry is bigger, more intractable, and more important than we had thought."
Lachmann, 2002, p. 184	". . . reading disabled are identified in the majority of the literature by a tested reading performance which is two years (or more) below what is expected from their potential."
Mercer & Mercer, 2005, p. 255	"Approximately 75 percent of poor readers in third grade continue to be poor readers in ninth grade. . ., and, unfortunately, reading disabilities persist into adulthood."
Mercer & Mercer, 2005, p. 255	"Estimates from well-designed longitudinal studies indicate that by fourth grade 20 percent of children are dysfunctional readers."
Lyon, Apr. 1998, p. 7	"Children raised in poverty, youngsters with limited proficiency in English, children with speech and hearing impairments, and children from homes where the parents' reading levels are low are relatively predisposed to reading failure. Likewise, youngsters with subaverage intellectual capabilities have difficulties learning to read, particularly in the reading comprehension domain."
IRA, 2001, p. 13	"Children of poverty are more likely than others to enter school without the knowledge and background necessary for learning to read and write."
Chapman, p. 96	"There is no single cause of reading problems. However, the children who are most at risk of reading problems are poor children."
AERA, 2004, p. 4	"Although [LEP] students can learn English reading skills in two years, their chances of failing later in school are still greater than native English speaking children. Even if excellent oral language support is provided in the primary grades, it takes far longer than two years for English-language learners to become as fluent as native speakers and to acquire the broad vocabulary and reading comprehension skills needed for sustained academic achievement. Successful English learning requires targeted and continuing intervention."

Researcher(s)	Findings/Conclusions
Biancarosa & Snow, 2004, p. 8	"In addition, the problems faced by struggling readers are exacerbated when they do not speak English as their first language, are recent immigrants, or have learning disabilities. Indeed, a struggling reader may fit all three of these descriptions, making intervention a truly complicated proposition."
Ortiz, A., 2001, p. 3	"The intent of early intervention is to create general education support systems for struggling learners as a way to improve academic performance and to reduce inappropriate special education referrals. Examples of early intervention include clinical teaching, peer and expert consultation, teacher assistance teams, and alternative programs such as those that offer tutorial or remedial instruction in the context of general education."
Grossen, 2000, p. 5	"The difference between a child who has a learning disability and a child who is simply a poor reader is only a difference in the severity of the problem."
Allington, 2001, p. 141	"First, the evidence now available indicates that some students will only achieve such standards with long-term literacy support. Such support will almost necessarily have to come from teachers with expertise in meeting the instructional needs of adolescents struggling with literacy learning. My point is that even with high-quality classroom instruction through the K-12 span and intensive, expert literacy intervention, some students will continue to find literacy acquisition a more difficult task than most of their peers. Historically we have labeled such students dyslexic or learning disabled and then largely abandoned attempts to teach them to read."
McGuinness, 1997, p. 167	"There are scores of studies which show that the majority of children diagnosed with 'attention deficit disorder' have serious reading or other learning problems, and most of the rest of these children have serious emotional problems, or both. This means that the inability to pay attention to classrooms is a symptom and not a cause."
Balfanz, McPartland, & Shaw, 2000, p. 12	"A continuum of extra-help needs to exist for high school students. The first group in this continuum consists of a very small percentage of students (5-10%) who are in need of intensive and massive extra help. Such students are those who enter ninth grade testing at the third or even second grade level and still need to learn elementary level skills. Next along the continuum there are a considerably larger number of students who have mastered the most basic skills but lack or have only weakly learned intermediate level skills. These students can decode but read with limited fluency."
Farber, 1999, p. 1	". . . although virtually all adolescents are able to carry out simple reading tasks, only 40 percent can read well enough to comfortably manage standard high school texts."
Kamil, 2004, p. 29	"While the focus of much concern in adolescent literacy is on comprehension, at least 10 percent of adolescents still have difficulties with word analysis and related skills. Therefore, policies should encourage the careful assessment of reading skills to be certain that individualized instruction is provided to each student."

Some may question the inclusion of limited-English proficient students in the list of at-risk learners. Many of the studies reviewed, however, included findings relevant to the use of ELS with this population. The special needs of English-language learners have been identified by Short and Echevarria (2004/2005), as well as others. While limited-English proficient students are not necessarily, but likely to be, economically disadvantaged and, thus, potentially delayed in language acquisition, and while they are certainly not any more likely to have disabilities than the general population, they do struggle in trying to learn how to read in their own language at the same time they are acquiring a second language.

The pressure has been intensified with No Child Left Behind since these students must now take annual tests to measure their growth in English-language proficiency, with the expectation that they will move at least one level each year. In addition, they have only a little more than three years to become proficient in English since they must take the state examinations in English their fourth year in United States schools. This standard is difficult for many native speakers of English to achieve, as test scores in every state verify. Short and Echevarria found the following:

> Many educators agree on the important sheltered instruction techniques that help students comprehend content—for example, slower speech, clear enunciation, use of visuals and demonstrations, targeted vocabulary development, connections to student experiences, and use of supplementary materials (p. 10).

ELS's computer-assisted instruction enables speech to be slowed down or speeded up, depending on student needs and provides clear enunciation and pronunciation so that English-language learners hear good English models of speech. The illustrations are also helpful in making connections to prior learning in the native language.

Meschyan and Hernandez (2004) further illuminate the reasons why ELS can be an effective intervention for English-language learners. First, they defined phonological ability as "the ability not only to present a word with the proper accent, but also to perceive accurately the individual sound units that comprise the unfamiliar spoken word" (p. 74). They synthesized a number of studies that established that "the ability to construct accurate and distinct short-term phonological representation of unfamiliar speech sounds predicts vocabulary learning" (p. 74). In other words, learning the phonemes of English is a prerequisite skill for learning vocabulary in English. Further, "once children construct more long-term phonological and semantic representations, vocabulary knowledge itself begins to mediate the learning of new words" (p. 75).

They elaborated on their conclusions as follows:

> . . . the ability to repeat aloud unfamiliar sound forms . . . accurately has been consistently found to predict native language learning. Therefore, it is feasible that this ability can also play a predictive role in L2 [second language] learning. In fact, several researchers have implicated good phonological or phonological-orthographic abilities in L2 learning success (p. 77).

Then they added:

> When knowledge of L2 phonology is limited, the ability to represent the speech sounds of the target language accurately is a preexisting ability that can facilitate and expedite L2 acquisition. Good phonological ability is a facilitator of higher level L2 abilities, such as vocabulary knowledge and reading comprehension. Individuals with below-average phonological abilities are not prevented from learning an L2; however, their journey to L2 learning may be longer and more arduous, requiring more exposes to the novel language before long-term learning takes place (pp. 77-78).

It seems evident, then, that exposing English-language learners to programs such as ELS would greatly accelerate their acquisition of English sounds, vocabulary, and fluency, as well as enable them to acquire comprehension skills in English. These research findings are substantiated by the consistently large gains that thousands of English-language learners who have participated in ELS labs typically achieve (see Chapter VI for analysis).

Many are familiar with the relationship between poverty and reading difficulties. What may not be such common knowledge, however, is that reading difficulties or disabilities most usually are a result of faulty phonological processing. It follows, then, that schools that do not provide adequate or appropriate instruction to correct that deficit not only do not correct an inherited disability through a therapeutic intervention, but they may also be exacerbating the condition in some students and causing a difficulty to evolve into a disability in others. SEDL (a) researchers noted that “Lack of explicit instruction in the relationships between letters and sounds most adversely affects at-risk students” (p. 7). A more blunt indictment was delivered by McGuinness (1997): “For many poor readers, their inadequate skill has been caused by bad methods” (p. 281).

It is important to identify who is at risk, but it also critical to know why. One of the most frequently referenced theoretical models for the reading process was developed by Adams (1990). This model includes four processing units that must work together and simultaneously for reading to occur. The four units are the orthographic processor, the phonological processor, the meaning processor, and the context processor. Mercer and Mercer explained that “Given that the capacity or development of the four processors varies among learners and that reading approaches stress different processors, teachers must use a variety of reading approaches to meet the needs of diverse learners” (p. 256). They

pointed out that teachers and diagnosticians must understand that "Weaknesses in one or more of these processors inhibits the ability to read fluently" (p. 256). This concept leads to scientific research verifying faulty sensory processing as the major cause of reading difficulties or disabilities.

Table 3 includes an SBR sampling of findings related to the various reasons why learners are determined to be at risk of school failure, including their faulty sensory processing. Just as at-risk populations are diverse, so are the reasons for their struggles.

Table 3: Why Are They At Risk?

Researcher(s)	Findings/Conclusions
Torgesen, 2004, p. 356	"Most children who enter school at risk for difficulties learning to read fall into one of two broad groups. Many children enter school with adequate oral language ability but have weaknesses in the phonological domain. Their primary problem in learning to read involves learning to read words accurately and fluently. In contrast, many other children, coming largely from families of lower socioeconomic or minority status, enter school with significant delays in a much broader range of prereading skills. . . . These children have weaknesses both in the broad oral language knowledge that supports reading comprehension and in the phonological and print-related knowledge required in learning to read words."
Foorman, Fletcher, & Fisher, 1996, p. 1	". . . for at least 30% of children the decoding process is not straightforward and must be taught."
Foorman, Fletcher, & Fisher, 1996, p. 2	"Of all children identified as learning disabled in schools, 80% are primarily impaired in reading; 90% of these children have problems with the development of decoding skills."
IRA, 1998, p. 6	"What about the 20% of children who have not achieved phonemic awareness by the middle of first grade? The research on this statistic is as clear as it is alarming. The likelihood of these students becoming successful readers is slim under current instructional plans."
Lyon, 1998, p. 8	". . . recent research has been able to identify and replicate findings which point to at least four factors that hinder reading development among children irrespective of their socioeconomic level and ethnicity. These four factors include deficits in phoneme awareness and the development of the alphabetic principle (and the accurate and fluent application of these skills to textual reading), deficits in acquiring reading comprehension strategies and applying them to the reading of text, the development and maintenance of motivation to learn to read, and the inadequate preparation of teachers."
Torgesen, 2004, p. 372	"Children with a mild learning disability who are provided with only weak instruction in the general education classroom or in another environment show larger reading impairments when tested than do children with the same degree of learning disability who have had stronger instruction."
McGuinness, 1997, p. 166	"Many children with reading problems exhibit behavior problems due to their inability and unwillingness to stay focused and 'on task.' Being asked to do something you can't do for six hours a day, for hundreds of days per year, year after year, knowing that your peers are fully aware of your shortcomings, must be the most distressing experience imaginable."

Researcher(s)	Findings/Conclusions
McGuinness, 1997, pp. 164-165	"Learning failure causes an inability to attend. The worse you are at something, the more brain cells you need to do it, the harder it is to keep doing it, and the harder it is to keep your attention focused on what you're doing."
Pennington, 1991, p. 4	"So I am proposing that two functional domains, executive functions and phonological processing, are the systems most vulnerable to developmental insult and therefore the substrates for the most common developmental disorders."
Pennington, 1991, p. 8	"Consonant with their late evolution and protracted development, phonological processes are subject to considerable individual variation, and disorders of phonological processes have a high prevalence rate."
Biancarosa & Snow, 2004, p. 8	"Part of what makes it so difficult to meet the needs of struggling readers and writers in middle and high school is that these students experience a wide range of challenges that require an equally wide range of interventions. . . . For some, the problem is that they do not yet read words with enough fluency to facilitate comprehension."
Farber, 1999, p. 1	". . . some older students struggle because they failed to learn fundamentals of reading in the primary grades, whereas others were competent readers early on but never progressed in fluency and comprehension sufficiently to read the texts encountered after 4th grade. Still others developed reading skills up to, say, a 6th or 8th grade level, but haven't actually read enough to develop the vocabulary or general knowledge that more advanced reading requires."
ERS, 2001, p. 7	"Poor word recognition and poor comprehension skills are two of the most frequently diagnosed reading difficulties among middle and high school students. Additionally, like younger students, middle and high school readers may experience reading difficulties due to deficits in the following areas: poor decoding skills, weak vocabulary, the inability to read strategically and actively, too few reading opportunities outside of school, and poor motivation, lack of confidence or avoidance behavior, all stemming from experiencing too much reading failure."
Balfanz, McPartland, & Shaw, 2000, p. 9	"The typical high school student who is a struggling reader does not have the fluency to simultaneously move smoothly through a complex passage with more advanced vocabulary and apply comprehension strategies to mentally interact with the author's work and accurately derive the intended meaning. . . . Overall, then the majority of high school students in need of extra help with reading need support and direction to make the transition from being a beginning reader to becoming an expert reader."
Partnership for Reading, 2002, p. 3	"Findings from the adult reading instruction research show that adults can have difficulties with any of the crucial aspects of reading alphabetics (phonemic awareness and word analysis), fluency, vocabulary, or comprehension. It is important to address adult students' abilities in each of these areas in order to identify what they already know as well as what they need to work on during instruction. One emerging principle in the ABE research suggests that assessing each component of reading in order to generate profiles of students' reading ability gives teachers much more instructionally relevant information than any test of a single component can."

Researcher(s)	Findings/Conclusions
Partnership for Reading, 2002, p. 3	"Some of the strongest ABE reading instruction research has to do with the assessment of adults' phonemic awareness. Phonemic awareness among adult non-readers is almost non-existent and is only a little better among adult beginning readers. . . . Trends in the research suggest that phonemic awareness does not develop as easily among adults with a reading disability."
Partnership for Reading, 2002, p. 3	". . . fluency can be taught to adults. . . fluency leads to increases in reading achievement."
Given, 2002, p. 75	"Children who demonstrate a deficit in short-term auditory memory or short-term visual memory generally demonstrate serious reading difficulties that could result in identification of a learning disability, because children fail to retain the information long enough to store the new words heard or read in long-term memory."
Mauer, 1999, p. 385	". . . children whose sensory input is not organized or integrated in the brain have sensory integrative dysfunction. Such a disorder leads to disorganized, maladaptive interactions with the environment from which faulty internal sensory feedback is produced, further perpetuating difficulties and causing problems in learning, development, and behavior."
Shaywitz, Shaywitz, et al, 2004, p. 926	"Such evidence of disruption in the normal reading pathways provides a neurobiological target for reading intervention."
McGuinness, 1997, p. 169	"When children are highly distractible, overly disruptive, and unable to stay 'on task,' this usually means they can't do the task."
Tannock & Martinussen, 2001, p. 15	"Current theories propose that the behavioral symptoms of ADHD are not primary features of the disorder but are attributable to underlying deficits in cognitive control processes that guide both behavior and cognitive functioning."
Tannock & Martinussen, 2001, p. 15	". . . researchers have found that individual differences in children's working memory abilities and inattention are related to academic achievement."
Tannock & Martinussen, 2001, p. 15	"These findings suggest that working memory problems may account for some of the behavioral symptoms of ADHD, as well as for some of the academic difficulties."
Sharron & Coulter, 1994, p. 16	"Feurstein's main tenet is that children who are unable to learn from experience or to benefit from teaching are usually suffering from cognitive deficiencies—put more simply, they have not learned to think coherently. They therefore have no apparatus with which to organize, store and re-use the mass of information which bombards children every minute of their waking lives. Instead of considering new problems and thinking them through with the benefit of past lessons learned, such children either react impulsively or become inert in the face of tasks or information that they do not have the intellectual means to solve or process."
Sharron & Coulter, 1994, p. 17	"[Feurstein] categorically maintains that children who are low-functioning and educationally retarded as a result of cognitive deficiencies which are 'social' in origin can be brought to function at average or above-average levels with Instrumental Enrichment."

Given the diversity of learners requiring an intervention to learn how to learn and learn how to read, and given the complexity of meeting all their needs, more specialists than any school could possibly afford and deploy would be required. Also, as reported by Snow, Burns, and Griffin (1998), even professionals such as

special educators, speech and language clinicians, English as a second language teachers, resource room teachers, and others may "lack specialized knowledge about the typical and atypical development of reading and of their role in supporting reading instruction" (p. 333). One might add that this would especially be true at the secondary level.

A major benefit of using SBR in decision-making is to identify effective practices that are also cost-effective. Schools using ELS, for example, have the benefit of all that specialized knowledge and skill consistently available and accessible for every student every day, in a highly individualized and differentiated environment. Schools can typically implement an ELS lab for much less cost than would be required to provide adequate professional development and follow up to build that kind of capacity—and in much less time.

Urgency for Early Identification and Intervention

". . . studies provide a renewed sense of urgency that effective interventions be provided without delay to children at risk of reading failure."
–Shaywitz and Shaywitz, 2004, p. 423

Because of cumulative SBR, CEI recommends that elementary schools implement ELS at the earliest level possible to prevent as many learning problems from developing as possible and to prevent any existing ones from worsening. One of the findings in scientific research is that some students "acquire" a learning disability as a result of poor or inadequate instruction (Torgesen, 2004, p. 373). An early implementation would allow immediate treatment to correct the problem, and it would eliminate the possibility of inadequate or inappropriate instruction from causing a problem. For example, a school could include ELS for all kindergarten students as a prevention component in its balanced literacy plan. Other schools without high percentages of at-risk learners might prefer to wait until mid-year of first grade to identify students for intervention.

All is not lost if the early intervention does not occur, but the longer the wait, the longer the treatment required, as the evidence indicates. The cumulative effect of the findings reported in Table 4 is a sense of urgency of the earliest possible intervention for any learner with a difficulty or disability.

Table 4: Urgency for Early Identification and Intervention

Researcher(s)	Findings/Conclusions
Molfese, 2000, p. 8	"This finding that electrophysiological measures obtained at birth successfully discriminate between infants who eight years later will display different levels of reading skills raises exciting possibilities regarding the early identification of children with potential language problems. This opens up the possibility that successful intervention of reading and language problems could be carried out before these problems later emerge in the child's behavior during the elementary school years."

Researcher(s)	Findings/Conclusions
Sternberg, 2003, p. 310	"In fact, there seem to be critical periods—times of rapid development, during which a particular ability must be developed if it is ever to develop adequately—for acquiring these understandings of language."
Shaywitz & Shaywitz, 2004, p. 423	". . . behavioral and neurobiological evidence converge to indicate that reading difficulties are not outgrown, do not represent a developmental lag, and remain with the child unless proven and powerful interventions are provided. We believe that this neurobiological evidence of the persistence of the neural anomaly presents an urgent call to provide children with early and intensive evidence-based reading interventions."
ERS, 2003, p. 4	"Every effort should be made to ensure that children's reading problems are recognized and addressed early, before the 'critical period' for learning to read passes and reading problems begin to interfere with the acquisition of content knowledge."
Shaywitz, 2003, pp. 264-265	"There is not a minute to waste. Instruction must be highly efficient and highly effective. Beginning around second grade, regular reading programs no longer address the kinds of phonemic awareness and basic phonics skill instruction that your struggling reader requires."
Kujala, Karma, et al, 2001, p. 2	"Because of the central nervous system's higher plasticity in early than later development stages, remediation programs should be started as soon as possible."
Snow, Burns, & Griffin, 1998, p. 99	"Identifying reading difficulties is essential for young school-age children, to ensure that intervention can be offered early and targeted to the children who need it most."
ERS, 2002, p. 63	"In sum, research provides a clear message to schools: children having problems learning to read should not be permitted to flounder. Instead, they should be provided with targeted and often intensive intervention."
Torgeson, 2004, p. 15	"First, schools must focus powerfully on preventing the emergence of early reading weaknesses—and the enormous reading practice deficits that result from prolonged reading failure—through excellent core classroom instruction and intensive, explicit interventions for children who are identified through reliable indicators as at risk of failure."
Lyon 1998, p. 12	"Our NICHD prevention and early intervention studies in Houston, Tallahassee, Albany, Syracuse, Atlanta, Boston, Seattle, and Washington, DC all speak to the importance of early identification and intervention with children at-risk for reading failure."
Sticht, 1997, p. 6	"Research indicates that it may take typical children six to eight years to become as competent in reading and comprehending the written language as they are at understanding oral language. It takes the typical reader with high school skills 12 years of reading broadly across a number of content areas—science, literature, history, to become a 12^{th} grade level reader. So becoming highly and broadly literate when starting from a low baseline of both knowledge—vocabulary concepts—and automaticity of word recognition takes a long time."
Molfese, 2000, p. 8	". . . the onset of puberty appears to set limits on the acquisition of certain language and cognitive skills. Thus, interventions begun at approximately 10 years of age could face ceiling limits placed upon their success by the child's developmental level and age."
McGuinness, 1997, p. 280	"The saying that 'an ounce of prevention is worth a pound of cure' is more relevant to reading instruction than to any other sphere of endeavor."
Wolfe & Brandt, 1998, p. 11	". . . an intervention program for impoverished children could prevent children from having low IQs and mental retardation."

Researcher(s)	Findings/Conclusions
Shaywitz, Shaywitz, et al, 2004, p. 026	". . . provision of an evidence-based intervention at an early stage of reading instruction leads to the development of fluent reading. . . the hallmark of skilled reading."
Shaywitz, 2003, p. 261	"According to G. Reid Lyon. . ., widespread implementation of these scientifically proven prevention and early intervention programs will substantially reduce the number of children needing special education in higher grades."
Alliance for Curriculum Reform, 1995, p. 81	"Carefully designed early intervention for children who experience difficulty in learning to read and write can produce significant long-term improvement."
Schmoker, 1999, p. 72	". . . a growing body of research show[s] that early intensive intervention ensures that students can get a good start in school by leaving 1st grade with the ability to read at grade level."
ERS, 2002, p. 65	"Intervention that takes place early on—in kindergarten through second grade, or even during the preschool years—is instrumental in getting children off to a good start in reading and preventing the need for remediation in the upper grades."
Strickland, 2001, p. 326	"The gradual trend away from long-term remedial programs at all levels and the growing emphasis on early intervention, prevention, and good 'first teaching' make the early years a key focus of reform."
ERS, 2992, p. 65	". . . the cost effectiveness of successful programs becomes apparent when they are compared with the high costs of remediation, retention, and placement in special education programs."

Characteristics of Effective Interventions

Just as researchers have identified the characteristics of effective at-risk programs in general and effective literacy programs for the general population (see Chapter III), they also have devoted considerable efforts to establish through scientific studies the characteristics of effective literacy interventions for learners who struggle. The Texas Education Agency (2002) published guidelines for schools to observe in identifying the components and features of a research-based reading program for struggling learners. This model, as do other similar ones, evolved from meta-analyses and/or research syntheses. The components they deemed important for children with special needs (which include all the at-risk populations) were as follows:

1. Explicit instruction
2. Multiple opportunities to practice and demonstrate learning so that reading becomes automatic
3. Opportunities to maintain and transfer (generalize) the skills and strategies learned
4. Progress is monitored regularly and adjustments made as needed
5. Materials at their reading level
6. Flexible grouping and intensive instruction
7. Technology-assisted reading instruction

8. Collaborative efforts among school personnel and parents that support the children's unique learning disabilities and needs (pp. 16-21).

Another way to determine whether ELS is based in scientific research is to measure its components against those verified by researchers—TEA's list, plus other components found critical by other researchers. The following table correlates the research findings with ELS features discussed throughout this study.

Table 5: Characteristics of Effective Literacy Interventions

Characteristic	ELS?
Explicit instruction	See Chapter III—Direct Instruction
Intensive Instruction	See Chapter IV—Active Engagement and Time on Task
Tutoring	See Chapter III—Tutoring
Word Recognition Instruction	See Chapter II—Multi-sensory Processing See Chapter III—Phonics and Phonemic Awareness
Phonics	See Chapter II—Multi-sensory Processing See Chapter III—Phonics
Phonemic Awareness	See Chapter II—Multi-sensory Processing See Chapter III—Phonemic Awareness
Fluency Development	See Chapter II—Multi-sensory Processing See Chapter III—Fluency See Chapter IV—Repetition and Practice
Vocabulary	See Chapter II—Multi-sensory Processing See Chapter III—Vocabulary
Comprehension	See Chapter II—Multi-Sensory Processing See Chapter III—Comprehension
Individualized and Differentiated Instruction	See Chapter II—Multi-sensory Processing See Chapter IV—Computer-Assisted Instruction See Chapter IV—Individualized and Differentiated Instruction
Computer-assisted	See Chapter II—Multi-sensory Processing See Chapter IV—Computer-Assisted Instruction
Scaffolding	See Chapter II—Multi-sensory Processing Methods See Chapter IV—Computer-Assisted Instruction See Chapter IV—Individualized and Differentiated Instruction
Visual and tactile support; picture cues	See Chapter II—Multi-sensory Processing See Chapter IV—Computer-Assisted Instruction and Computer Screen Design
Opportunities to Practice	See Chapter II—Multi-sensory Processing and Methods See Chapter III—Lesson Phases, Lesson Models, Direct Instruction, Mastery Learning, and One-to-One Tutoring See Chapter IV—Repetition and Practice
Motivation	See Chapter IV—Computer-Assisted Instruction See Chapter IV—Assessment Feedback See Chapter V—Motivation
Auditory Input	See Chapter II—Multi-sensory Processing
Transfer	See Chapter II—Multi-sensory Processing

Characteristic	ELS?
Parental Involvement	See Chapter V—Parental Involvement
Early Identification and Intervention	See Chapter I—ELS Description and Uses See Chapter II—Urgency
Acceleration	See Chapter II—Multi-sensory Processing Methods See Chapter IV—Repetition and Practice See Chapter VI—CEI Pre- and Post-test Scores
Corrective Feedback	See Chapter IV—Assessments and Feedback
Frequent Assessments	See Chapter III—Direct Instruction and Mastery Learning See Chapter IV—Assessments and Feedback
Self-Assessment	See Chapter IV—Assessments and Feedback See Chapter IV—Self-Assessment

There are similarities, of course, between the intervention components on this list and the components of an effective comprehensive literacy program for all students (see Chapter III—Characteristics of Comprehensive Literacy Programs), but those similarities are chiefly in the areas of knowledge and skills to be taught. Torgesen (2004) emphasized this point:

> Perhaps the most important conclusion to draw from recent intervention research is that intervention instruction should focus on the same major dimensions of knowledge and skill that are taught in the regular classroom but must be *more explicit and intensive than classroom instruction to prevent or remediate reading difficulties* [emphasis added] (p. 363).

Neuman and Roskos (1998) provided more specificity:

> Teaching children a word family by saying the word *at* and asking them to put the letter *p*, then *f*, then *m* before it on a workshop does not turn them into robots; on the contrary, it is likely to teach them many different words and sounds over time. It is important for us to adjust our teaching strategies to meet the children's needs and not our own (p. 18).

In other words, schools must have as their content and skill goals for at-risk students the same expectations as they have for general education students. What differs is the approach, the instruction, and the strategies used to move at-risk students forward in literacy learning.

A recent, widely-publicized literacy intervention designed by Shaywitz, Shaywitz, Blachman, Pugh, Fulbright, Skudlarski, et al. (2004) provides other scientific research on what constitutes effective intervention strategies. Based on their review of a range of neurobiological investigations, they hypothesized that reading failure is the result of a "dysfunction in left hemisphere posterior reading circuits" (p. 926). They concluded, then, that "Such evidence of a disruption in the normal reading pathways provides a neurobiological target for reading interventions" (p. 926).

Their experimental intervention consisted of 50 minutes daily in "individual tutoring that was explicit and systematic and focused on helping children understand the alphabetic principle (how letters and combinations of letters represent the small segments of speech known as phonemes)" (p. 927). Their five-step lesson included "(1) a review of sound-symbol associations . . ., (2) practice in phoneme analysis and blending. . ., (3) timed reading of previously learned words to develop fluency, (4) oral reading of stories, and (5) dictation of words with phonetically regular spelling-sound patterns" (p. 927).

The researchers used tests to measure changes in learning and brain imaging processes to measure differences in brain activity in the treatment group, as compared to the control group. Their most significant finding was that "the nature of the remedial educational intervention is critical to successful outcomes in children with reading disabilities and that the use of an evidence-based phonologic reading intervention facilitates the development of those fast-paced neural systems that underlie skilled reading" (p. 930). They found further that "brain activation increases as reading skill increases" and that "It is this occipitotemporal region that continued to develop 1 year after the intervention had ended" (p. 930). Their findings, they concluded, "suggest plasticity of the neural systems for reading in children" (p. 931), providing educators with assurance that reading difficulties and disabilities can indeed be treated successfully.

In summary, the Shaywitz, Shaywitz, *et al*. study, found the following:

> . . . these data demonstrate that an intensive evidence-based (phonologic) reading intervention brings about significant and durable changes in brain organization, so that brain activation patterns resemble those of typical readers, with the appearance of the left occipitotemporal area and improvement in reading fluency (p. 931).

After much review and discussion of this study and the parallels of the researchers' intervention and the academic results, CEI staff prepared a correlation document: *Essential Learning Systems and Its Correlation to a Successful Intervention for Left Occipitotemporal Systems.* A part of the analysis displayed the correlation of specific ELS tasks with each of the five steps in the experimental intervention. For instance, Phoneme Introduction is aligned with "review of sound-symbol associations"; ELS's Word Building activity is aligned with "practice in phoneme analysis and blending; the Long Term Recall task in ELS correlates with "timed reading of previously learned words to develop fluency"; ELS's Fluency Passages, Quick Tales, and eQuick Tales are the same as "oral reading of stories"; and ELS's Copy-Write equates with "dictation of words with phonetically regular spelling-sound patterns."

Although neither CEI nor schools measure brain activity with imaging processes, they do use assessments to measure growth in student learning. On average,

special education students participating in ELS labs gain almost two years for one year of instruction, and 37 percent gain two years or more. These gains are unusual among special education students in most schools but are predictable outcomes when, as in the Shaywitz, Shaywitz, et al. study, an evidence-based intervention such as ELS is used.

ELS as an Effective At-Risk Program

Given the increasing emphasis on accountability at the federal, state, and local levels, especially in the federal programs discussed, educators seek to know not only the criteria for selecting content and instructional strategies that are based in scientific research, but also the characteristics of effective programs in general for students who are at risk of failure. Slavin and Fashola (1998) derived several "conditions that are usually present in programs that work" from the hundreds of research articles that they examined in compiling a study on the programs that do work. Table 6 below displays the research-based list of characteristics of general programs for students at-risk, alongside a description of the ways in which the ELS program correlates.

Table 6: ELS Alignment with Effective At-Risk Programs

Conditions Present in Effective Programs	ELS
Effective programs have clear goals, emphasize methods and materials linked to those goals, and constantly assess students' progress toward the goals (p. 64).	The goal for all participating learners in ELS programs is the improvement of literacy and learning-to-learn skills. The research base for each ELS component, including its assessments, is documented in this study.
Effective and replicable programs have well-specified components, materials, and professional development procedures (p. 65).	ELS has been implemented in more than 5000 educational settings, including schools, learning centers, adult education centers, and rehabilitation centers. The research base for each of the instructional tasks (or program components), as well as the specific instructional strategies, is documented in this study. The professional development provided for teachers, administrators, and technicians by CEI is described, and the research base is documented in this study.
Effective programs provide extensive professional development. A characteristic shared by almost all of the effective programs we identified is the provision of extensive professional development (p. 65).	ELS's professional development and ongoing follow-up coaching are described, with their research base, in this study.

Conditions Present in Effective Programs	ELS
Effective programs are disseminated by organizations that focus on the quality of implementation. The programs identified in this review that have been associated with consistent positive effects in many settings tend to be ones that are developed and disseminated by active, well-structured organizations that concentrate efforts on ensuring the quality of program implementation in all schools (p. 66).	CEI's support program features and its service orientation are all designed to provide schools with the necessary support for effective implementation so that they get the achievement results they need. CEI's central focus is on its services and support for partner schools. The services provided are described in this study.

Multi-Sensory Processing

"Everything in memory begins as a sensory input from the environment." –Wolfe, 2001, p. 78

One of the most important, most effective—and most unique—features of ELS is its informed use of multi-sensory processing in instructional activities. Before the term is defined, it may be important to explain what multi-sensory processing is *not.* Multi-sensory processing is not just another term for the concept of learning styles. Stanovich and Stanovich (May 2003) pointed out in a recent publication that the concept of learning styles "has never been demonstrated to work in practice" (p. 30). One of the harmful practices that has evolved from that popular concept has been the matching of auditory learners with phonics instruction and visual/kinesthetic learners with holistic instruction, they explained. They continued: "Excluding students identified as 'visual/kinesthetic' learners from effective phonics instruction is a bad instructional practice—bad because it is not only not research based, it is actually contradicted by research" (p. 30).

A potential outcome of the slavish practice over time of matching students solely with their preferences would be the handicapping, rather than empowerment, of a learner since over-accommodating the learner's learning preference would never build strength in the other modalities. Stanovich and Stanovich referenced research that "found no consistent evidence for the idea that modality strengths and weaknesses could be identified in a reliable and valid way that warranted differential instructional prescriptions" (p. 30). Another study found likewise—that "the idea of modality preferences did not hold up to empirical scrutiny" (p. 30). These researchers are not stating that there is no such thing as learning preferences. What they are saying is that those preferences do not dictate teaching methods for reading instruction.

Multi-sensory processing, as opposed to learning styles, is a term that comes out of the research of cognitive scientists, neurobiologists, linguists, and other experts who study how people learn, remember, retrieve, and apply knowledge and skills. It is, according to Mercer and Mercer (2005), "based on the premise that some students learn best when content is presented in *several* [emphasis

added] modalities. Frequently, kinesthetic (movement) and tactile (touch) stimulation is used along with visual and auditory modalities" (p. 306).

The content of most multi-sensory structured language programs, again according to the Mercers (2005), "includes instruction in the following areas: phonological awareness including phonemic awareness, phonics including sound-symbol connections that involve decoding. . . and encoding . . ., syllable instruction, morphology, syntax, and semantics" (pp. 306-307). These are all included in ELS (see Chapter III).

McIntyre and Pickering (1995), as quoted by Mercer and Mercer (2005), noted that such programs typically include the following instructional features:

1. Simultaneous multi-sensory activities in the visual, auditory, kinesthetic, and tactile modalities that are used concurrently to enhance memory and learning.
2. Systematic progression of logical language learning that moves from easy to difficult and includes periodic review.
3. Direct instruction that involves explicit teaching of all strategies, skills and concepts.
4. Systematic practice of word recognition and spelling skills at the word, sentence, and text levels with decodable text.
5. Diagnostic teaching that features continual monitoring and ongoing individualized instruction.
6. Instruction that focuses on using synthetic and analytic decoding strategies (p. 307).

These instructional features are, for the most part, evident in ELS. (See Chapter III for the rationale for ELS's use of alternative strategies to synthetic phonics.)

People are generally familiar with some of the basic concepts of sensory processing. According to Sternberg (2003), "Information processing theorists seek to understand cognitive development in terms of how people of different ages process information (i.e., decode, encode, transfer, combine, store, retrieve it), particularly when solving challenging mental problems" (p. 462). He further explained that "Any mental activity that involves noticing, taking in, mentally manipulating, storing, combining, retrieving, or acting on information falls within the purview of information processing approaches" (p. 462).

New information comes to the brain through one or more of the senses (visual, auditory, kinesthetic, olfactory, tactile). Simply put, it is very temporarily parked in a storage area called short-term memory. It is then quickly filtered to determine whether it is related to any previous knowledge or skill, whether it makes sense given what else is known, and how it fits into what is valued by the learner. If the new learning is not filtered out and, given opportunities to practice

or rehearse it—to *process it*—it then enters into long-term memory for more permanent storage.

There is another storage area in the brain termed working memory. Working memory is the area where stored knowledge/skill from long-term memory is retrieved for temporary consideration, as well as where short-term memory is held for consideration through conscious use of strategy (such as verbal rehearsal). There are various theories and models about how the information processing model actually works, where in the brain the different information is stored, and how connections between what is learned are made, but research is moving those theories to converge.

One thing that is known is that storage space is limited in both short- and working-memory. Research has established that the average person can hold only about nine items at the most in short-term memory and that the information quickly decays (Sternberg, 2003, p. 155). That is why social security numbers are only nine digits, telephone numbers are only seven, and zip codes are only five. Through memory devices such as chunking or clustering (see Chapter IV), more items can be remembered. The length of time that items stay in short-term memory is typically only seconds—perhaps up to a couple of minutes, unless there is input or output interference, and then the life of the information diminishes rapidly (Sternberg, p. 157).

The goal of ELS and, indeed, of all instruction is to move new information and skills into long-term memory as efficiently as possible so that it can be retrieved at will and applied to new situations. One of the theories about how that is done is called the “levels-of-processing framework,” originally proposed, according to Sternberg, by Fergus Craik and Robert Lockhart (1972) (p. 158). This framework sees knowledge storage along a continuum “in terms of depth of encoding” (p. 159). In other words, “the deeper the level of processing, the higher, in general, the probability that an item may be retrieved” (p. 159).

The levels-of-processing framework includes three levels: physical, acoustic, and semantic. The physical level includes “visually apparent features of the letters.” “Sound combinations associated with the letters (e.g., rhyming)” is the basis for the acoustic level. The semantic level has to do with the “meaning of the word” (Sternberg, p. 159). These concepts relating to depth of processing are the grounding for ELS’s instructional tasks, which are called SHARE—See, Hear, And REspond. ELS incorporates all three processing levels in an attempt to embed the lesson content into long-term memory as effectively as possible.

For instance, over a sequence of lessons, each set of lesson words (organized in word families—or chunked) is presented visually so that the learner sees each letter, as well as the shape of the word. The learner sees (physical level) an illustration that can serve as a cue in subsequent sessions of the word to be learned. Also, the student hears (acoustic level) the word pronounced and

spelled and can prompt the computer to repeat the pronunciation and/or spelling, if needed. Further, the student is provided both with a definition of the lesson word and a sentence using the word in a meaningful context (semantic level). Stein (2001) explained these concepts in this way:

> Reading requires the integration of at least two kinds of analysis. . . . First, the visual form of words, the shape of letters, their order in words, and common spelling patterns, which is termed their orthography, has to be processed visually. Their orthography yields the meaning of familiar words very rapidly without needing to sound them out. But for unfamiliar words, and all words are fairly unfamiliar to beginning readers, the letters have to be translated into the speech sounds (i.e., the phonemes) that they stand for, and then those sounds have to be melded together in inner speech to yield the word and its meaning. Reading exclusively by the phonological route is more time consuming than if words can be accessed directly without requiring phonological mediation (p. 534).

After Look Listen See Say introduces ELS users to the set of lesson words, individualized and differentiated instruction continues. The students are provided information in one modality—or in one level of processing, and then they are asked to recite it or respond in another. For instance, a student is provided visual (physical) and auditory information (acoustic) in a session, and the student will respond in a kinesthetic/tactile mode by highlighting, writing, or typing the word. Next, a student is given auditory information and is asked to respond in a kinesthetic/tactile mode. In the next instance, the student is provided physical information and is expected to respond in the acoustic. Practice sessions are plentiful and varied so that there is deep processing of the sound, spelling, and definition of all lesson words, and there is an expectation that students will achieve 100 percent on mastery lessons before moving on to the next lesson.

In summary, Sternberg's (2003) depiction of the levels-of-processing framework (p. 159) and examples of ELS encoding activities are correlated, as follows:

Level of Processing	Basis for Processing	ELS Example
Physical	Visually apparent features of the letters	Each lesson word is provided in print, and an illustration is available. In some lessons, both the definition and the context sentence are provided in print.
Acoustic	Sound combinations associated with the letters	Each lesson word is pronounced and spelled aloud. Definitions and context sentences may be presented aurally.
Semantic	Meaning of the word	The definition of each lesson word is provided, and the word is used in a sentence, providing context.

In multi-sensory processing, therefore, all the relevant senses are employed for each student so that neural pathways that enable people to learn and remember—and learn to read—are accessed and strengthened, regardless of the individual's weaknesses or strengths in learning. Multi-sensory processing uses all three levels of processing, as described by Sternberg, so that learning is retained and so that it can be retrieved, regardless of the sensory modality in which it was originally encoded.

Another reason to use multi-sensory processing is to address the diversity of difficulties or disorders that may exist in a classroom. It is true that a large majority of people who struggle with reading have some kind of phonological deficit, but, according to Mody (2004), there are other problems as well. She reported that "40% of children with reading disabilities may have an independent, co-occurring attention deficit disorder" (pp. 60-61). She continued: ". . . the functional significance of the auditory, visual, and attention problems frequently observed in some children with reading and language impairments, and their relationship to the core deficit in phonology, remains unclear." In the meantime, an effective intervention must address more than just problems with auditory discrimination.

Progress is being made in scientific research to discover the kinds of specific interventions that result in activation of the areas of the brain reserved for the various kinds of processing, which means that learning has occurred. Mody described a recent study that hypothesized as follows:

> . . . the development of the occipitotemporal circuit, which constitutes a memory-based word identification system supporting fluent word recognition, is dependent on the integrity of the temporoparietal circuit, which is responsible for basic recording and analytical processing (p. 65).

She then explained that this is "why poor readers who have difficulties with phonological decoding typically fail to achieve reading fluency: Their temporoparietal and occiptitotemporal circuits, which are involved in phonological analysis and fluent word recognition, respectively, appear to be affected and, hence, show reduced activation" (p. 65).

This information is consistent with that described earlier in this chapter from another major study conducted by Shaywitz and Shaywitz and other colleagues (2004). They reported that several studies they examined showed "a failure of left hemisphere posterior brain systems to function properly during reading" (p. 926). They continued: "This neurobiological evidence of dysfunction in left hemisphere posterior reading circuits is already present in reading-disabled children and cannot be ascribed simply to a lifetime of poor reading" (p. 926).

The evidence that most learning difficulties or disabilities are caused by faulty sensory processing led developers to include multi-sensory processing as a major feature of ELS. Mauer (1999) explained the dysfunction as follows:

> A premise is that children whose sensory input is not organized or integrated in the brain have sensory integrative dysfunction. Such a disorder leads to disorganized, maladaptive interactions with the environment from which faulty internal sensory feedback is produced, further perpetuating difficulties and causing problems in learning, development, and behavior. Learning involves the organization and adaptation of that information to any situation. These abilities are lacking in children with sensory integrative dysfunction (p. 385).

In other words, sensory integration is vitally important in learning to read. Again, ELS's SHARE activities (the individualized and differentiated instructional tasks) are designed to remedy processing problems.

The most salient of the scientific research findings on multi-sensory efficacy, which is overtly related to the achievement of fluency and to the development of memory (long-term recall), follows in Table 7.

Table 7: Research Findings on Multi-Sensory Processing

Researcher(s)	Findings/Conclusions
Wolfe, 2001, p. 135	"Learning is a process of building neural networks."
Wolfe, 1998, p. 61	"The only way to get information into the brain is through our senses."
Molholm, Ritter, Murray, et al, June 2002, p. 115	"Integration of information from multiple senses is fundamental to perception and cognition. . . ."
Mauer, 1999, p. 383	"Sensory integration (SI) theory and intervention have been used for the treatment of children with a wide range of learning and developmental challenges. SI refers to the ability to organize, integrate, and use sensory information from the body and the environment. SI theory is based on the belief that the integration of the sensory system is the foundation for successful development or motor abilities, organization, attention, language, and interpersonal relationships."
Wolfe & Brandt, 1998, p. 10	"The brain changes physiologically as a result of experience. The environment in which a brain operates determines to a large degree the functioning ability of the brain."
Mauer, 1999, p. 387	"Ayres defined the goal of SI therapy as improving the way the brain processes and organizes sensations."
Mauer, 1999, p. 386	"One common symptom of children with sensory integrative dysfunction is the inability to maintain an appropriate state of alertness through ordinary activities, as well as to focus and attend to a task. This is especially evident with language comprehension tasks consisting of intense amounts of auditory information that the nervous system must process."
Caine & Caine, 1991, p. 86	"Success depends on using all of the senses and immersing the learner in a multitude of complex and interactive experiences."

Researcher(s)	Findings/Conclusions
Given, 2002, p. 81	"Listening, speaking, reading, writing, and other academic skill development depend on the cognitive system. The cognitive system depends on sensory input and the adequate functioning of the attention, information processing, and memory subsystems for the construction of knowledge and skills."
National Center for Learning Disabilities, p. 1	"An information processing disorder is a deficiency in a person's ability to effectively use the information the senses have gathered. It is NOT the result of hearing loss, impaired vision, an attention deficit disorder or any kind of intellectual or cognitive deficit."
National Center for Learning Disabilities, p. 1	"Though information processing disorders are often not named as specific types of learning disabilities, they are seen in many individuals with learning disabilities and can often help explain why a person is having trouble with learning and performance. The inability to process information efficiently can lead to frustration, low self-esteem and social withdrawal, especially with speech/language impairments."
Tileston, 2000, pp. 21-22	". . . we cannot assume that students come to us with the structures already in place to learn new material. We must first establish what they know and understand and where there are no previous connections, supply them for the student."
Given, 2002, p. 67	"Receiving auditory input, making some sense of it, and deciding what to do with it sounds easy, but at various places along the way, malfunctioning neurons or inappropriate chemical reactions can create hearing impairments or various learning disabilities. . . . Specific instruction in phonemic awareness is critical as early as possible to help children establish discrete networks before a single collective neural net becomes firmly entrenched and similar sounds are perceived as one."
Levine & Swartz, p. 2	". . . the neurodevelopmental status of a student's phonological abilities and awareness is closely tied to their word decoding skills—a critical subskill of overall competency in reading."
Peterson, Fox, Rosner, Minton, & Raichle, Feb. 1988, p. 589	"The use of positron emission tomography to measure regional changes in average blood flow during processing of individual auditory and visual words provides support for multiple, parallel routes between localized sensory-specific, phonological, articulatory and semantic-coding areas."
National Center for Learning Disabilities, p. 1	"While there are several different and often overlapping types of information processing, two important groups are: visual processing (visual discrimination, visual sequencing, visual memory, visual motor processing, visual closure, and spatial relationships) and auditory processing (auditory discrimination, auditory memory, and auditory sequencing)."
Lachmann, 2002, p. 177	"Thus, reading not only requires the recognition and decoding of visual shapes, but also the storage and retrieval of visual, phonological, and semantic information from long- as well as from short-term memory. . . . In a way, reading reflects a continuing working memory process. . . in the sense that it reflects a collection of mental processes, which permit information to be held temporarily in an accessible state, in the service to perform some mental task."
Sousa, 2001b, p. 94	"Recent studies of young children with language-learning difficulties indicate that they may have a dysfunction in brain-timing mechanisms, which makes processing of certain speech sounds difficult. Researchers discovered that by using computer-processed language programs that pronounced words more slowly, some children were able to advance their reading levels by two years after just four weeks of training. This improvement was maintained for at least a year."

Researcher(s)	Findings/Conclusions
Levine & Swartz, 1995, p. 3	"A neurodevelopmental dysfunction may exist because of a lack of sufficient use of that function, because of cultural influences, because of inadequate or ineffective teaching in the past, or, in fact, as a result of genetic or acquired central nervous system lesions."
Marzano, 1992, p. 61	"The final stage of learning a skill or a process is to internalize the knowledge: to practice it to the point where you can perform it with relative ease. Actually, it is most accurate to think of skills and processes as being located on a continuum of skill levels ranging from controlled processing to automaticity."
Grossen, 2001, p. 7	". . . explicit, systematic instruction in sound-spelling relationships in the classroom was more effective in reducing reading disabilities than a print-rich environment characterized by interesting stories, even with children who had benefited from phonemic awareness instruction in kindergarten."
Snowling, 1987, p. 147	". . . it is good practice to encourage dyslexics to use all their senses during learning—to rely upon their strengths to compensate for and circumvent their weaknesses."
Shaywitz & Shaywitz, 2004, p. 419	". . . great progress has been made in identifying the neural systems for reading in good readers and in identifying a disruption in these systems in struggling readers."
Shaywitz & Shaywitz, 2004, p. 423	"In addition to the accumulating evidence about the definition, prevalence, persistence, etiology, and cognitive basis of reading disability, there is now evidence about the neurobiological basis of reading and reading disability."
Shaywitz & Shaywitz, 2004, pp. 81, 83	"We have also learned that dyslexic children and adults turn to alternate compensatory reading systems. Brain image records as dyslexic readers try to sound out words show the posterior system on the left side of the brain is not working; instead, these slow but accurate readers are relying on alternate secondary pathways, not a repair but a different route to reading."
Lyon, Apr. 1998, p. 5	"Does this mean that children who have a difficulty understanding that spoken words are composed of discrete individual sounds that can be linked to letters suffer from brain dysfunction or damage? Not at all. It simply means that the neural systems that perceive the phonemes in our language are less efficient than in other children."
Kujala, Karma, et al, 2001, p. 2	"Neural dysfunctions underlying dyslexia are still largely unknown despite decades of research. Dyslexia has been identified as a problem of phonological processing. . ., although other difficulties like those in visual processing have also been reported. . . . Dyslexic individuals might actually suffer from a more general auditory-perception problem, which may underlie their difficulties in phonological perception. . . . For example, some authors suggest that these individuals have problems in processing temporal aspects of the speech signal, such as rapid acoustic transitions or tone-order reversals. . . . However, even some other aspects of sounds, such as rhythm or pitch, are problematic for individuals with dyslexia. . . . The evidence suggesting that these individuals have dysfunctions also in their nonlinguistic auditory and visual perception. . . supports the view that a general sensory-processing disorder is involved.
Kujala, Karma, et al, 2001, p. 2	"The fact that training even altered the early preattentive stage of sound discrimination while also improving reading performance gives support to the view that reading difficulties in dyslexic individuals, at least in part, stem from bottom-up processing constraints."

Researcher(s)	Findings/Conclusions
Kujala, Karma, et al, 2001, p. 2	"Our results support this view that difficulties in dyslexia are based, at least to some extent, on the dysfunction of general sensory discrimination rather than on deficits specific to phonological processing."
Shaywitz & Shaywitz, 2004, p. 419	". . . studies provide unequivocal proof that reading originates in and relies upon the complex systems of the brain in place for processing the sounds of language."
Grossen, 2000, p. 5	"Phonological processing is the primary ability area where children with reading difficulties differ from other children. It does not seem to matter whether the children have an IQ-achievement discrepancy in reading or not. Phonological processing encompasses at least three different components (phonological awareness, phonological recoding in lexical access—rapid naming and phonological recoding in working memory). Of these three major phonological processing skills, phonological awareness appears to be the most prevalent linguistic deficit in disabled readers."
Lyon, Apr. 1998, p. 5	". . . we now have strong evidence that it is not the ear that understands that a spoken word like "cat" is divided into three sounds and that these discrete sounds can be linked to the letters C-A-T, it is the brain that performs this function. In some youngsters, the brain seems to have an easy time processing this type of information. However, in many children, the skill is only learned with difficulty, and thus must be taught directly, explicitly, and by a well trained and informed teacher."
Herrell, 2000, p. 144	"The use of multiple intelligences strategies supports the students' learning of new materials because it allows them to use the processing systems in which they integrate knowledge most effectively. By providing multiple ways for the students to demonstrate their understanding, their confidence in their own abilities is fostered and their anxiety is reduced."
Sousa, 2001b, p. 17	"Studies of sensory preferences in school children over the past 40 years have shown shifts among the percentage of students with particular preferences. . . . Note that nearly one-half of this population has a visual preference and just under one-fifth has an auditory preference. Yet in too many secondary school classrooms, talk is the main mode of instruction, often accompanied by minimal overheads or charts. Over one-third of students have a kinesthetic-tactile preference, indicating that movement helps their learning. But think of how much kids in secondary schools just sit at their desks, moving only to change classrooms."
McGuinness, 1997, p. 155	"If you want a child to be a good reader, a good speller, and a creative writer, then your first goal is to create efficient and automatic subroutines in the sensorimotor skills that should not require overt attention, such as encoding and decoding."
Williams & Lecluyse, Feb. 1990, p. 121	". . . the visual processing of disabled readers is characterized by a longer integration time and a slower processing rate for both simple and word-like stimuli."
Sylwester, 1995, p. 61	". . . dyslexia may be at least partly a result of a coordination problem in the timing of the fast and slow visual pathway systems."
Sousa, 2001b, p. 95	"So, for many individuals, dyslexia may really be dysphonia—an incorrect auditory-visual association between phoneme and grapheme. If so, then remedial strategies should focus on reestablishing correct phonemic connections with intense practice."
Snowling, 1987, p. 18	". . . the disabled readers had difficulty integrating visual and verbal codes."

Researcher(s)	Findings/Conclusions
Sousa, 2001b, p. 97	"Efforts to remediate nonlinguistic reading and language problems are showing some encouraging results. Tallal and Merzenich tested a treatment that improved the ability of children with language disorder to hear brief sounds presented in rapid succession—a skill necessary for speech perception and reading."
Talcott, et al., 2000, p. 9	". . . orthographic information has been suggested to play an important role in programming saccadic eye movements during reading. The magnocellular pathway provides the main visual input to neural structures important for eye movement control. . . . Poor fixation stability or poor eye movement control therefore would be expected to degrade the orthographic information that is available in the parafovea immediately preceding a saccade."
Levine & Swartz, 1995, p. 2	"When a student is having difficulty, it is therefore important to begin the diagnostic process by posing the following questions, 'Where is the breakdown occurring?' and 'Which of the neurodevelopmental functions required to learn and apply this subskill are weak or unable to assume their share or play their vital roles?' Thus, a child may harbor a neurodevelopmental dysfunction in a particular function and/or there may exist a dysfunction at the junctions between functions. In either case, the breakdown prevents the student from succeeding."
Talcott & Witton, 2001, p. 21	"Although our data do not prove a casual relationship, they do show that dynamic sensory processes are likely to contribute to the development of children's literacy skills. This hypothesis stands in contrast to theoretical perspectives that view literacy skill development as exclusive to the domain of modular language skill. Moreover, whereas previous versions of a sensory processing hypothesis have been derived mainly from experiments comparing dyslexic and control groups, our studies have also examined unselected children who are learning to read. Our data suggest that sensory processing is important for the development of literacy skills in all readers."
Clay, 1991, p. 95	"The new activity of reading demands that he use his eyes to scan and analyze the printed text. The language and the visual aspects of a reading task now have to be related. There has to be an association of the analyzed speech with the analyzed shapes. This is the third area of which the child may have difficulty—pairing the visual and auditory stimuli. He may find it difficult to match the flow of auditory signals coming to his ear with the order of visual patterns on the page of his text. Specifically, he may have trouble relating the timing of the language behaviour to the spacing of visual experiences."
Sternberg, 2003, p. 205	"We appear to be better able to recall information when we are in the same physical context as the one in which we learned the material."
Sternberg, 2003, p. 205	". . . when information is encoded in various contexts, the information also seems to be retrieved more readily in various contexts, at least when there is minimal delay between the conditioning contexts and the novel context."
Sternberg, 2003, p. 206	"Encoding specificity: What is recalled depends on what is encoded."
Sternberg, 2003, p. 206	"To summarize, retrieval interacts strongly with encoding. If you are studying for a test and want to recall well at the time of testing, organize the information you are studying in a way that appropriately matches the way in which you will be expected to recall it. Similarly, you will recall information better if the level of processing for encoding matches the level of processing for retrieval."

Multi-Sensory Processing Methods

Thus far, multi-sensory processing has been defined and explained within the context of the "levels-of-processing framework" known to cognitive scientists. Scientific research has also been conducted to identify the most effective methods to use relating to multi-sensory processing. An example that mirrors the procedures used in ELS (particularly in the SHARE and Copy-Write tasks) is provided by Mercer and Mercer (2005) in the effective teaching of spelling:

> Spelling involves skills in the visual, auditory, and motor sensory modalities. The student must be able to exhibit visual and auditory recognition and discrimination of the letters of the alphabet and must have motor control to write the word. Thus, a child who has learned to spell a word by the use of the senses of hearing, sight, and touch may be in a good position to recall the spelling of that word when needed in writing because any or all the sensory modes can elicit memory (p. 350).

The findings of other studies relating to multi-sensory methods are reported below:

Table 8: Research Findings on Use of Multi-sensory Processing Methods

Researcher(s)	Findings/Conclusions
Papanicolaou, Pugh, et al, 2004, p. 411	"Indeed, instruction and practice seem essential for developing and strengthening the neural networks that must be in place for the brain to support complex activities such as reading."
Shaywitz, 2003, p. 84	"The brain's reliance on patterns of connectivity may have particular relevance to the teaching of reading since within these systems patterns of neural connections are continually reinforced and strengthened as a result of repeated practice and experiences."
International Dyslexia Association, 2000, p. 1	"Multisensory teaching is simultaneously visual, auditory, and kinesthetic-tactile to enhance memory and learning."
International Dyslexia Association, 2000, p. 1	"There is a growing body of evidence supporting multisensory teaching. Current research, much of it supported by the National Institute of Child Health and Human Development (NICHD), converges on the efficacy of explicit structured language teaching for children with dyslexia. Young children in structured, sequential, multisensory intervention programs, who were also trained in phonemic awareness, made significant gains in decoding skills. These multisensory approaches used direct, explicit teaching of letter-sound relationships, syllable patterns, and meaning word parts. Studies in clinical settings showed similar results for a wide range of ages and abilities."
National Study Group, 2004, p. 16	"Learning is more powerful when students are prompted to take information presented in one format and 'represent' it in an alternative way. Cognitive research tells us that we process information in multiple ways—visually and through auditory-verbal channels. Students' learning and recall can be improved by integrating information from both the verbal and visual-spatial forms of representation."

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 111	". . . specific types of instruction can modify the brain, enabling it to use alternative sensory input to accomplish adaptive functions, in this case, communication."
Berliner & Casanova, 1993, p. 79	"What contemporary research on long-term memory reminds us is that we never stop learning through movement, touch, and imagery, even when the verbal/symbolic learning mode becomes dominant. Thus, if we want to help children remember the things that we deem important, we should help them whenever we can to construct visual representations and give them some multisensory experiences during learning."
Tileston, 2000, pp. 19-20	"The classroom that is enriched with teaching techniques from all three modalities, and in which new information is given in 15- to 10-minute segments for secondary and 7- to 10-minute segments for elementary students with time for processing in between, will be a place where quality learning is possible.
Tileston, 2000, p. 69	"Much software is available to the classroom today that incorporates visual, verbal, and kinesthetic learning. . . . Students who need visuals to learn, students who are dyslexic and need graphic representations, will be able to view the learning in a format that is comfortable and meaningful to them."
Adams, 1990, p. 366	"The children who studied the words alongside the pictures made significantly more correct responses during the learning trials than those who studied the words without pictures. This, of course, is consistent with the premise that pictures should help cue the desired response."
Shaywitz, 2003, p. 269	"I want to tell you about the most effective way to practice reading single words. This is referred to as speeded word training, the goal of which is to make a child a really fast responder. In practice, a deadline is imposed on how quickly a word needs to be named, with shorter deadlines resulting in faster reading speeds. The goal is to bring naming times below one second per word so that the child names at least sixty words per minute."
Sprenger, 1999, pp. 85-86	"For this type of memory retrieval, I simply have the students give me the information orally or have them write it down."
Mauer, 1999, p. 385	"The development of communication competence relies on the child's sensory experiences with the environment and his or her ability to respond adaptively. Visual and auditory processes are considered to be the end products of many more fundamental aspects of brain function. . . . For speech-language skills to develop, . . . the sensory and motor portions of the brain, especially the vestibular and auditory systems, must have efficient neural connections with the speech-language areas of the brain."
Bruer, 1993, p. 265	"We should present subjects in a variety of ways, using multiple representations that resonate with the students' multiple intelligences. We should assess intelligence and learning in a variety of ways, also."
Levine, 2002, p. 310	"As teachers gain neurodevelopmental expertise, they are in a far better position to understand students who are struggling to keep up. . . . A teacher then has the option either to bypass the student's area of difficulty or intervene and seek to repair the student's breakdown—or, even better, to do both."

Researcher(s)	Findings/Conclusions
Levine, 2002, p. 308	"I would like teachers to become the community's front-line experts on mind development and learning in the age group(s) they work with. . . . A teacher should be knowledgeable about the high specific neurodevelopmental functions required for success in these realms and the differences in learning that teachers are likely to encounter among any cohort of students. The recent outpouring of research on brain function and learning should flow directly into classrooms. A teacher who acquires background knowledge about neurodevelopmental matters can understand the ways in which different learners have their personal ways of knowing."
Mercer & Mercer, 2005, p. 351	Kearney and Drabman (1993) used a modified write-say-spelling intervention designed to provide immediate feedback to the visual and auditory modalities of students with learning problems. The students' spelling accuracy significantly increased through the use of the procedure."

ELS as Therapeutic Intervention

The research on the needs of at-risk learners, the research on effective intervention program characteristics, the research on multi-sensory processing used to diagnose and as a treatment for most learning difficulties or disabilities, and the research on effective multi-sensory methods provide the preponderance of evidence educators need to radically reduce the numbers of learners currently "left behind."

Schools can be effective through the use of a scientifically-based therapeutic intervention such as ELS. Therapeutic interventions are used in many disciplines. In education, it is usually either physical therapy, occupational therapy, or speech/language therapy delivered through special education programs. But the therapy offered by ELS need not be confined to those with identified learning disabilities. Rather, diverse learners with learning or reading difficulties have demonstrated benefit.

An intervention becomes therapeutic if it includes an assessment and diagnosis of each learner; an individualized and differentiated prescription or treatment; the inclusion of appropriate content and skills; the employment of research-based instructional strategies; the use of assessments to monitor results and to make decisions about next steps; and ongoing assessment to determine when the problem is adequately remediated.

ELS is, therefore, a "therapeutic intervention" for struggling learners for the following reasons:

- ELS includes the research-based content found in comprehensive literacy programs and literacy interventions—which are highly similar (see Chapters II and III).

- ELS incorporates the instructional strategies (see Chapters II and IV) that are known to be effective with at-risk learners (e.g., explicit, systematic, intensive instruction; opportunities for practice; computer-assisted instruction; time-on-task; ongoing assessment and feedback; etc.).

- ELS includes several support features (such as motivation and recognition programs, parental support, etc.) known to be important in teaching at-risk learners successfully (see Chapter VI).

- ELS was created for use with struggling learners, whether their problems were acquired or inherited, and the research is clear that these learners must have a different approach to instruction in order to learn efficiently and effectively (see Chapter II).

- ELS uses frequent and ongoing assessments to diagnose and prescribe the appropriate level of lesson, the appropriate sequence of lessons, and the appropriate parameters in lesson delivery for effective treatment, and to monitor progress and mastery. The selected lesson set also provides necessary repetition and review (see Chapter IV).

- ELS uses computer-assisted instruction in order to provide totally individualized and differentiated treatment (Chapter IV).

- ELS uses a therapeutic approach called multi-sensory processing (see Chapter II) as a major strategy to help learners overcome their difficulty or disability and learn to read.

Summary

This chapter began with the research on at-risk populations, a very diverse group of learners ranging from those who are economically disadvantaged and perhaps delayed in language acquisition, to English-language learners with their own issues of acquiring proficiency in two languages at once under demanding timelines, to students who have "acquired" difficulties as a result of inappropriate or inadequate instruction to meet their needs, to mild learning disabilities, to more severe disabilities. The at-risk population includes pre-schoolers, K-12 students who have not learned to read, and adults who lack reading ability and/or who lack English-language proficiency.

The second section presented the sense of urgency in the literature for early identification and treatment of learning/reading difficulties or disabilities. The bad news, according to Reid Lyon (1998) is that, "if we delay intervention until nine-years of age (the time that most children with reading difficulties receive services), approximately 75% of the children will continue to have difficulties

learning to read throughout high school. To be clear, while older children and adults can be taught to read, the time and expense of doing so is enormous" (p. 9).

The good news comes from the Commission on Adolescent Literacy:

> Happily, highly effective programs for addressing such reading difficulties are capable of significantly improving a reader's skills, sometimes as much as the equivalent of three years of reading proficiency over the course of one year. More commonly the equivalent of at least one year's improvement is observed for each six months of instruction, depending on the intensity of instruction and the severity of the reading problem. And so while addressing the problem early is ideal, it is never too late to learn to read" (p. 289).

Characteristics of research-based and effective literacy interventions were provided in the third section, including a summary of a recent study by Shaywitz, Shaywitz and colleagues of an effective intervention, along with evidence of ELS's inclusion of those characteristics in its design and implementation.

The most important and unique component of ELS, multi-sensory processing, was then defined in the context of theory and research from cognitive psychology and related disciplines. The ELS SHARE tasks and the supporting practice tasks are constructed to reflect the concept of the "levels-of-processing" framework, so that deep and repeated practice is provided to move new knowledge about a word family's individual words, their similar spellings, and their definitions into the permanence of long-term memory and so that they can be retrieved for application. The research-based methods for effective use of multi-sensory processing were then discussed.

And, finally, a summary of the reasons that ELS can be termed to be a "therapeutic intervention" was provided.

Chapter III: ELS Program Tasks, Phases, Lesson Models, and Content

Teacher/Facilitator Engagement

"An effective teacher is one who is able to convince not half or three quarters but essentially all of his or her students to do quality work in school."
–Glasser, 1990, p. 14

ELS is not just educational software. It was designed initially and continues to emphasize the role of the teacher/facilitator in effective instruction, monitoring progress, coaching and encouraging, diagnosing needs, and adapting the program as required for student success. Successful implementations invariably are a result of engaged, reflective teachers/facilitators, who never turn responsibility for all the content, instruction, monitoring, assessment, or decision-making over to the computers, but who think continually about ways to move student learning forward and who are continuously adapting lesson sequences and lesson parameters, as well as supplementing the software instruction with whatever is needed to ensure an individual student's success. Exemplary labs, for example, include classroom libraries appropriate to the reading levels and challenges for the students being served. They include, as well, professional dialogue between and among the lab's teacher/facilitator and other teachers of the students being served. The ELS program's approximately 30 tasks include individual student work on the computer, but also one-on-one recitation to the teacher, self-assessments, presenting work for teacher assessment, and deliberate transitions between activities to allow time for processing of new information and skills.

There is a great deal of research on the importance of teacher mediation to facilitate student learning. Lev Vygotsky, a Russian psychologist, who lived in the early years of the 20th century, has led the way in this area. Rodriguez and Bellanca (1996) relied upon his research in advocating that role for teachers in their book aimed at urban educators. They defined mediation as "a mutual interaction between the mediator . . . and the student." They continued: "The mediator purposefully directs the interaction toward a specific goal by focusing attention, selecting, framing, interpreting, and cuing the student on specific stimuli . . . . With such mediation the child develops the internal controls that enable him to learn how to learn" (pp. 15-16).

In a grant-funded research study on teacher engagement, Louis and Smith (1996) described four types of teacher engagement that are inferred in the literature. The one that matches CEI's vision for an effective teacher/facilitator is the "engagement with students as unique, whole individuals rather than as 'empty vessels to be filled'." The definition continued as follows:

> Teachers demonstrate this type of engagement when they listen to students' ideas, get involved in students' personal as well as school lives, and make themselves available to students who need support or

> assistance. Other examples of teacher engagement with students are formal and informal coaching, sponsoring, mentoring, and counseling activities (p. 126).

Thus, the suggested job description for an ELS teacher/facilitator included by CEI in its *ELS Implementation Toolkit* delineates the following roles:

- Preparing the classroom and the students for the program
- Administering and scoring third-party assessments
- Administering the *ELS Placement Test* to select the appropriate ELS lessons
- Using the ELS software—the CEI Learning Manager, the ELS Player, CEI Evaluate, the Computerized ELS Placement Test, and supplementary CEI software
- Training students to use the ELS software
- Monitoring students as they work through lessons
- Checking for mastery and reviewing as needed
- Documenting and analyzing student progress
- Modifying lessons to challenge, but not overwhelm the students
- Planning and conducting focused reading instruction that encourages transfer to the regular classroom
- Safeguarding equipment, software, materials, and supplies
- Communicating student progress to the principal, to other teachers of assigned students, and to parents
- Participating in CEI Facilitator Training and advanced professional development workshops (p. 10).

This job description reflects a great many of the principles of effective teaching established by Brophy, Hunter, Berliner, Stallings, Rosenshine, Shulman, and others during the 1970s and 1980s and have been synthesized by Crawford, Bodine, and Hoglund (1993). The principles that are embedded in this job description follow:

- Effective teachers establish rapport with their students and provide a pleasant and orderly environment that is conducive to learning (p. 223).
- Effective teachers maximize time on task by using minimum class time for noninstructional routines (p. 224). (See discussion of Time-on-Task in Chapter IV.)
- Effective teachers clearly define expected behavior (p. 224).
- Effective teachers plan carefully and thoroughly for instruction (p. 224).
- Effective teachers continually monitor learners' behavior to determine whether they are progressing toward the stated objective (p. 225). (See discussion on Assessment in Chapter IV.)

- Effective teachers heed the results of their monitoring and adapt their instructional strategies accordingly (p. 225). (See discussion of Informed Instruction in Chapter IV.)
- Effective teachers require all learners to practice new learning while under direct teacher supervision (p. 226). (See discussion of Repetition and Practice in Chapter IV.)
- Effective teachers expect learners to practice skills without direct teacher supervision but only after guided practice has shown that the learners understand what is expected (p. 226). (See discussion of Repetition and Practice in Chapter IV.)

Similar research-based discussions of the importance of the teacher, including those running ELS labs, are provided in the table below:

Table 9: Research Findings on Teacher/Facilitator Engagement

Researcher(s)	Findings/Conclusions
IRA, 2000, p. 1	"This position statement provides a research-based description of the distinguishing qualities of excellent classroom reading teachers. Excellent reading teachers share several critical qualities of knowledge and practice. . . . They are good reading 'coaches' (that is, they provide help strategically)."
Dixon-Krauss, 1996, p. 9	"For Vygotsky cognitive development was due to the individual's social interactions within the environment."
Dixon-Krauss, 1996, p. 20	"Teacher mediation is more than modeling or demonstrating how to do something. While the teacher is interacting with the student, he continuously analyzes how the student thinks and what strategies the student uses to solve problems and construct meaning. From this analysis the teacher decides how much and what type of support to provide for his students."
Dixon-Krauss, 1996, p. 26	"The social dialogue that occurs during literacy interactions is a key factor in learning. The ultimate goal for a teacher of young children should be to provide the assistance, through social dialogue, that is necessary for children to move from other-regulated to self-regulated reading and writing."
Dixon-Krauss, 1996, p. 16	"The teacher's role in supporting learning within the zone of proximal development involves three key elements: (1) The teacher mediates or augments the child's learning. She provides support for the child through social interaction as they cooperatively build bridges of awareness. (2) The teacher's mediational role is flexible. What she says or does depends on feedback from the child while they are actually engaged in the learning activity. (3). The teacher focuses on the amount of support needed. Her support can range from very explicit directives to vague hints."

Researcher(s)	Findings/Conclusions
Taylor, Pearson, Clark & Walpole, 2000, p. 157	"Although different terms have been used to describe what we have called coaching (e.g., use of structuring comments, probing of incorrect responses, scaffolded instruction), others have found this type of 'on the fly' instruction to be a characteristic of effective teachers. Our most accomplished teachers exhibited a general preference for coaching over telling or recitation, whereas the least accomplished teachers engaged more commonly in telling. We did find the practice of coaching during reading to provide word recognition instruction to be characteristic of both the most effective schools and the most accomplished teachers."
IRA, 2000, p. 3	"Excellent reading teachers interact with individual children frequently in the course of their daily teaching activities. As they help children solve problems or practice new skills and strategies, they 'coach' or 'scaffold' children by providing help at strategic moments. They are skilled at observing children's performance and using informal interactions to call children's attention to important aspects of what they are learning and doing. They often help children with a difficult part of the task so that the children can move forward to complete the task successfully. It is important to note that such teaching is neither incidental or unsystematic. Excellent reading teachers know where their children are in reading development and they know the likely next steps. They help children take these steps by providing just the right amount of help at just the right time."

ELS software provides research-based lesson phases, lesson models, and content in its more than 30 tasks that are available for each set of words to be learned. In themselves and without further embellishments, they are powerful in assisting students in learning how to learn and learning how to read. But ELS as a total program is far more than software, and its power cannot be fully realized without the engagement of quality teachers/facilitators—another component that is also firmly supported by research studies.

Deconstructing ELS

In order to document the scientifically-based evidence that grounds ELS, it was necessary to "deconstruct" it. That is, as described in the methodology section in Chapter 1, the authors of this study sat with CEI staff to identify and code all the component parts—how overall lessons are designed, what the various tasks are and how they are individually designed, the list of content and skills taught in each task, the instructional strategies used, the assessment strategies used, and the list of program features that support implementation. The challenge, then, became, how to make it clear that each of these topics does not operate in isolation from the others, but rather almost everything is happening dynamically in any student's individual lesson—just as it does in a lesson delivered solely by a teacher.

The topics have been categorized and discussed in a logical order, but it is important for the reader to be aware at all times of the overlapping, intertwined,

cross-cutting, reiterative, spiraling, concurrent, interrelated juxtaposition of the various component parts, one with the other—all constantly mediated and scaffolded by the computer and the lab's teacher/facilitator. Such an approach is similar to studying separately the sheet music for each orchestra instrument. Much can be learned in doing so, but it is the symphony in performance led by an inspired and inspiring conductor that makes the music. Effective instruction, therefore, provides the desired result—the music.

Lesson Phases

The Alliance for Curriculum Reform (1999), led by Gordon Cawelti, included three "phases of teaching learning strategies" (p. 16) in their research synthesis on how to improve student achievement: instructional, practice (guided or independent), and assessment. Mercer and Mercer (2005) provided a similar set of "systematic teaching steps" (p. 133) for lesson phases for students with disabilities:

1. opening the lesson
2. conducting an interactive presentation
3. closing the lesson
4. using continuous teaching components.

The Mercers' explanations for these four steps would suggest that "opening the lesson" equates to Cawelti's instructional phase; "conducting an interactive presentation" provides the guided practice; "closing the lesson" is both review and the provision of independent practice; and "using continuous teaching components" is ongoing assessment, both on how to improve the lesson and to guide next steps.

The cognitive theory behind these phases is explained by Sternberg (2003), who reports on studies by Anderson on the acquisition of procedural knowledge. Anderson hypothesized that "knowledge representation of procedural skills occurs in three stages: cognitive, associative, and autonomous" (p. 270). Sternberg's explanations follow:

> During the cognitive stage, we think about explicit rules for implementing the procedure. During the associative stage, we practice using the explicit rules extensively, usually in a highly consistent manner. Finally, during the autonomous stage, we use these rules automatically and implicitly, with a high degree of integration and coordination, as well as speed and accuracy (p. 270).

Table 10 includes a list of the "tasks" in ELS. Coding was added in the second column to indicate whether the task is instructional, practice (guided or independent), or assessment. The third column indicates the type of lesson model that is used—whether direct instruction, mastery learning, or tutoring, or

some combination. These three models have a wealth of scientific research behind them as to their effectiveness.

Table 10: ELS Tasks with Phase, Model, and Content

ELS Task	Task Phase	Lesson Model
Letter Recognition	I, P, A, M	DI, ML, T
Sound Express	I, P, A, SA	DI, ML, T
Phoneme Introduction	I	DI, ML, T
Look Listen See Say	I	DI, ML, T
See Hear Spell	I, P, A, M	DI, ML, T
Hear Spell	I, P, A, M	DI, ML, T
Teacher Echo	I, P, A	DI, ML, T
Auditory Feedback	P, SA	DI, ML, T
See Say	A	DI, ML, T
Echo	P, A	DI, ML, T
Word Match	P, A	DI, ML, T
Clues	P, A	DI, ML, T
Copy-Write	P	DI, ML, T
Copy-Write-Editing	A, SA	DI, ML, T
Quick Pick	P, A	DI, ML, T
Quick Talk	P, A	DI, ML, T
Word Meaning Review	A, M	DI, ML, T
Long-Term Recall	A, M	DI, ML, T
Fluency Passages	P	DI, ML, T
Word Building Activity	P, A	DI, ML, T
Clues Activity	P, A	DI, ML, T
Word Match Activity	P, A	DI, ML, T
Quick Tales	P, A	DI, ML, T
eQuick Tales	P, A	DI, ML, T
Picture This	P	DI, ML, T
Crosswords	P	DI, ML, T
Word Searches	P	DI, ML, T
WAC	P	DI, ML, T
CEI Journal	P	DI, ML, T
Sentence Assembler	P	DI, ML, T

I=Instruction; P=Practice; A=Assessment; SA=Self-Assessment; M=Mastery
DI=Direct Instruction; ML=Mastery Learning; T=Tutoring

Lesson Models

The three lesson models—direct instruction, mastery learning, and one-to-one tutoring—that are utilized in ELS are clearly related. All three are goal-focused; all three include explicit strategies; all three emphasize corrective feedback; all three involve ongoing assessment to determine progress; and all three are proven methods for improving student learning. One major difference is that direct instruction models typically involve the whole class moving through instruction together; mastery learning separates students for instruction into groups, based upon their individual needs. And tutoring is one-to-one.

Direct Instruction. The Alliance for Curriculum Reform and the Educational Research Council (1999) included a definition of direct instruction in their synthesis of research on improving student achievement:

> Six phased functions of direct teaching work well:
> 1) daily review, homework check, and, if necessary, re-teaching;
> 2) presentation of new content and skills in small steps;
> 3) guided student practice with close teacher monitoring;
> 4) corrective feedback and instructional reinforcement;
> 5) independent practice in seatwork and homework with a high (more than 90 percent) success rate; and
> 6) weekly and monthly reviews (p. 14).

Others define the model similarly. For instance, according to the Mercers (2005), Simmons, Fuchs, and Fuchs (1991) created a similar "instructional template to help teachers include explicit teaching steps within their lessons":

1) present an advance organizer
2) demonstrate the skill
3) provide guided practice
4) offer corrective feedback
5) set up independent practice
6) monitor practice
7) review (p. 149).

The efficacy of the direct instruction model is well studied and documented. Table 10 indicates the presence of direct instruction steps throughout the ELS tasks. Representative findings are provided in the table below:

Table 11: Research Findings on Direct Instruction

Researcher(s)	Findings/Conclusions
Walberg & Paik, p. 12	"Many studies show that direct teaching can be effective in promoting student learnings. The process emphasizes systematic sequencing of lessons, a presentation of new content and skills, guided student practice, the use of feedback, and independent practice by students."
Torgesen, 2004, p. 359	". . . if learning was measured by growth in word reading ability, then methods that included direct instruction in component skills produced the most powerful effects."
Foorman, Fletcher, & Francis, 1996, p. 3	"Direct instruction in decoding skills emphasizing the alphabetic code results in more favorable outcomes than does a context-emphasis or embedded approach, according to NICHD."

Researcher(s)	Findings/Conclusions
Schmoker, 1999, p. 73	"A look at the most effective early reading programs reveals meticulously devised direct instruction to be one of its essential aspects."
Grossen, 2000, p. 5	"Treatment intervention research has shown that appropriate early direct instruction seems to be the best medicine for reading problems."
USDE, 1986, p. 35	"Direct instruction has been particularly effective in teaching basic skills to young and disadvantaged children. . . ."
Ellis & Fouts, 1997, p. 224	"We recommend that districts interested in a research-tested curriculum of basic skills for young learners and at-risk children should seriously consider D.I. It is, after all, one of a minority of educational innovations that has evidence on its side."
Sousa, 2001b, p. 22	"An analysis of almost 30 years of research indicates that the following intervention(s) are most effective with learning disabled students. The most effective form of teaching was one that combined direct instruction. . . with teaching students the strategies of learning."
Alliance for Excellent Education, Jan. 2004, pp. 2-3	"There are strategies that are effective with secondary students who struggle with word identification, including direct instruction. . . ."
Kamil, 2004, p. 9	". . . there remains a group of middle and high school students who have reading problems that result from not having mastered the alphabetic principle. The research suggests that instruction can help remediate this problem. . .: systematic, explicit, and direct instruction produce the best results. . . ."
Mercer & Mercer, 2005, p. 131	". . . direct, explicit instruction was compared with milieu teaching (an approach that combines student-directed with teacher prompts) and was found to be more effective for instruction in advanced linguistic skills."
Mercer & Mercer, 2005, p. 292	"Direct instruction yields positive outcomes in reading comprehension."
Schug, Tarver & Western, Mar. 2001, p. 1	"The research base for direct instruction is unusually solid. Basic research and evaluation studies carried out by various methods, in several settings, and over a period of more than 25 years, show that direct instruction has strong, positive effects on children's achievement in reading, as measured by tests of decoding skills, reading comprehension, and attitudes toward reading."

Table 10 indicates the use of direct instruction (DI) in all of the instructional tasks in ELS. CEI, however, does not assume, as the DI model does, that all students should do the same lessons on the same day at the same time. ELS is highly individualized, but each student's individual lesson has the other characteristics of direct instruction with the benefits of one-to-one tutoring.

Mastery Learning. While direct instruction is the model for a single lesson, mastery learning describes a sequence of lessons, including pre-testing of students to determine which students need which instruction. The Alliance for Curriculum Reform (1995) defines the research supportive of the mastery learning lesson model as follows:

> More than 50 studies show that careful sequencing, monitoring, and control of the learning process raises the learning rate. Pre-testing helps determine what should be studied; this allows the teacher to avoid assigning material that has already been mastered or for which the student does not yet have requisite skills. Ensuring that students achieve mastery of initial steps in the sequence helps ensure that they will make satisfactory progress in subsequent, more advanced steps. Frequent assessment of progress informs teachers and students when additional time and corrective remedies are needed (p. 16).

An early researcher on the effectiveness of mastery learning was Benjamin Bloom (1984). He found that the "average student under mastery learning was above one standard deviation above the average of the control class, or above 84 percent of the students in the control class" (p. 5). Subsequent studies also attest to the power of this model, as provided in the table below:

Table 12: Research Findings on Mastery Learning

Researcher(s)	Findings/Conclusions
Levin & Long, 1981, p. 7	"The mastery learning studies show that when students are given extra time and appropriate help, and when they are motivated to learn, 80 percent or more can finally attain the preset mastery level on each learning unit. One of the more striking and consistent results of these studies is the pattern of learning of mastery groups versus control groups. . . . Control and mastery groups start at the same achievement level. As learning progresses, it is apparent that the mean performance level of the mastery groups becomes significantly higher than that of the control groups. This is true even before the mastery students engage in the corrective process."
Piotrowski & Reason, 2000, p. 51	". . . general schemes focusing on phonological development would provide an ideal basis for inclusive practices if they contained explicit guidance on 'assessing to teach' and the principles and practices of 'mastery learning,' i.e., on planned repetition and revision that ensures retention of what has been learnt."
Ellis & Fouts, 1997, p. 185	"The research literature in mastery learning is largely positive. Some of the best-known names in educational research circles have weighed in as supporters of this approach to teaching and learning . . . . Study after study indicates the superiority of mastery learning over traditional methods in raising test scores."

ELS, as documented in Table 10, uses the mastery learning lesson model in the design of its program tasks. Before instruction begins, each student is administered three different assessments to provide data for the teacher/facilitator in making a decision about program placement. The program provides each student the instruction he or she needs, constantly providing individualized repetition and practice and constantly assessing. The results are fed back to the teacher to make program adjustments or to

adapt the lesson parameters to better meet changes in learning needs. A student does not typically do every one of the 30 tasks in a lesson. Rather, he or she does the ones prescribed for mastery and for continuing development. When a student does not master at the 100 percent level, then he or she is automatically recycled through specified tasks in the lessons until mastery is attained.

One-to-One Tutoring. The single most powerful form of teaching, according to Benjamin Bloom (1984), is one-to-one tutoring:

> Using the standard deviation (sigma) of the control class, which was taught under conventional conditions, it was found that the average student under tutoring was about two standard deviations above the average of the control class. Put another way, the average tutored student outperformed 98 percent of the students in the control class (p. 5).

Other researchers found similar results:

Table 13: Research Findings on One-to-One Tutoring

Researcher(s)	Findings/Conclusions
Alliance for Curriculum Reform, 1995, p. 15	"Because it gears instruction to needs, tutoring has yielded large learning effects in several dozen studies."
Alliance for Curriculum Reform, 1999, p. 17	"Teaching one student or a small number with the same abilities and instructional needs can be remarkably effective."
Learning First Alliance, 1998, p. 15	"One-to-one tutoring, closely aligned with classroom instruction, has been effective for struggling first graders."
Learning First Alliance, 1998, p. 18	"One-to-one tutoring programs built on sound phonetic principles can often make a remarkable difference in students' reading performance in a period of months."
Learning First Alliance, 1998, p. 20	"Other effective uses of Title I resources include one-to-one tutoring. . . ."
National Research Council, 1997, p. 126	"Just as for students with mild disabilities, research indicates that one-to-one intensive instruction helps develop the skills of students with more severe cognitive disabilities."
Torgesen & Hecht, 1996, p. 153	"It may indeed be the case that the only way to provide opportunities for some children to acquire normal reading skills is to provide one-on-one instruction over a significant period of time."
Mercer & Mercer, 1995, p. 49	"Intensive tutorial teaching frequently is used to help students with learning problems learn a new skill. In addition, one-to-one instruction is appropriate for students who are learning skills that are different from the rest of the class. One-to-one tutoring is a powerful instructional arrangement."

In an ideal, affluent world, this tutorial lesson model is the one all schools would and should use. The expense of such a model, however, is prohibitive—without the use of technology. Computer-assisted instruction

(see Chapter IV) allows one teacher to supervise the work of many students, all receiving one-to-one instruction at the same time via the computer. Gilbert & Han (1999) noted that traditional instruction is designed for one teacher to teach many students. Tutoring is designed for one-to-one. With technology, schools can have a delivery system that is many-to-one. That is, individualized lessons can be delivered to many students with all the characteristics of expert one-to-one tutoring at once, and this concept is one on which ELS is based. Tutoring is a component of all the ELS instructional tasks.

Lesson Content and National Reading Panel Alignment

Given the importance of the National Reading Panel's (2000) research findings, especially in beginning reading, Table 14 was constructed to show the alignment of each of the ELS tasks with one or more of the five components found by the NRP and mandated in NCLB to be critical to early reading instruction: phonics, phonemic awareness, fluency, vocabulary, and comprehension.

All five components are found in multiple tasks, and the only two tasks that do not show correlations are Copy-Write-Editing, which is an assessment task for a phonics activity, and CEI Journal, which provides opportunities for students to practice writing skills (narrative and expository) through responses to writing prompts or graphics.

Research on what is needed for students who struggle to learn to learn and/or to learn to read almost always emphasizes the explicit teaching of basic skills—the five components identified by the National Reading Panel as critical in students learning to read. As Gagne' (1985) stated, "Students must have a firmament of basic skills and of knowledge that makes up the content of their thinking: one cannot think in a vacuum" (p. 149).

Table 14: ELS Task Alignment with NRP Components

ELS Task	Task Phase	Lesson Model	NRP Alignment
Letter Recognition	I, P, A, M	DI, ML, T	Phonics
Sound Express	I, P, A, SA	DI, ML, T	Phonics, Phonemic Awareness
Phoneme Introduction	I	DI, ML, T	Phonics, Phonemic Awareness
Look Listen See Say	I	DI, ML, T	Phonics, Vocabulary, Comprehension
See Hear Spell	I, P, A, M	DI, ML, T	Phonics
Hear Spell	I, P, A, M	DI, ML, T	Phonics
Teacher Echo	I, P, A	DI, ML ,T	Phonics, Phonemic Awareness, Fluency
Auditory Feedback	P, SA	DI, ML, T	Phonemic Awareness
See Say	A	DI, ML, T	Phonemic Awareness, Phonics, Fluency
Echo	P, A	DI, ML, T	Phonics, Fluency
Word Match	P, A	DI, ML, T	Vocabulary, Comprehension
Clues	P, A	DI, ML, T	Vocabulary, Comprehension
Copy-Write	P	DI, ML, T	Phonics
Copy-Write-Editing	A, SA	DI, ML ,T	

ELS Task	Task Phase	Lesson Model	NRP Alignment
Quick Pick	P, A	DI, ML, T	Phonics, Phonemic Awareness
Quick Talk	P, A	DI, ML, T	Fluency
Word Meaning Review	A, M	DI, ML, T	Vocabulary, Comprehension
Long-Term Recall	A, M	DI, ML, T	Fluency
Fluency Passages	P	DI, ML, T	Fluency
Word Building Activity	P, A	DI, ML, T	Phonics
Clues Activity	P, A	DI, ML ,T	Vocabulary, Comprehension
Word Match Activity	P, A	DI, ML, T	Vocabulary, Comprehension
Quick Tales	P, A	DI, ML, T	Comprehension
eQuick Tales	P, A	DI, ML, T	Comprehension
Picture This	P	DI, ML, T	Vocabulary
Crosswords	P	DI, ML, T	Phonics, Vocabulary
Word Searches	P	DI, ML, T	Phonics
WAC	P	DI, ML ,T	Phonics, Vocabulary
CEI Journal	P	DI, ML, T	
Sentence Assembler	P	DI, ML ,T	Comprehension

Phonics. A brief recounting of the major findings from prominent and credible researchers is provided below to substantiate the NCLB mandate that the five components identified by the NRP be central in Reading First programs. The National Reading Panel's final report included a number of very clear and very definitive conclusions from their meta-analysis regarding the importance of teaching phonics in an early literacy program:

Table 15: NRP Research Findings on Phonics

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 2-92	"Findings provided solid support for the conclusion that systematic phonics instruction makes a bigger contribution to children's growth in reading than alternative programs providing unsystematic or no phonics instruction."
NRP, 2000, p. 2-93	"The conclusion supported by these findings is that various types of systematic phonics approaches are significantly more effective than non-phonics approaches in promoting substantial growth in reading."
NRP, 2000, p. 2-95	". . . systematic phonics instruction contributed more than non-phonics in helping kindergartners and 1st graders apply their knowledge of the alphabetic system to spell words."
NRP, 2000, p. 2-95	"Students taught phonics systematically outperformed students who were taught a variety of nonsystematic or non-phonics programs, including basal programs, whole language approaches, and whole-word programs."
NRP, 2000, p. 2-94	"Phonics instruction produced substantial reading growth among younger children at risk of developing future reading problems. Phonics instruction also significantly improved the reading performance of disabled readers (i.e., children with average IQs but poor reading . . . ."
NRP, 2000, p. 2-95	"The conclusion drawn is that systematic phonics instruction is beneficial to students regardless of their SES."

A number of prominent researchers arrived at similar conclusions many years before the NRP report. For instance, Stahl (2002) noted in his report on reading research that "Chall's 1967 review is full of insight, but one basic finding continues to be cited to this day—Early and systematic instruction in phonics seems to lead to better achievement in reading than later and less systematic instruction. These results have been supported in nearly every review since" (p. 333).

A 1986 publication by the Department of Education gave this advice based on research findings:

> Children get a better start in reading if they are taught phonics. Learning phonics helps them to understand the relationship between letters and sounds and to 'break the code' that links the words they hear with the words they see in print (p. 21).

In 1990 Adams found similar results:

> There are enormous differences in the outcomes of any program depending on the particular schools, teachers, children, and implementation vagaries involved. Yet despite all of these very real and significant differences, there seems to be something about that broad class of instruction known as phonics that is of general, substantive, and lasting value (p. 49).

According to the Center for the Improvement of Early Reading (2001), a phonics program is "systematic" if the "plan of instruction includes a carefully selected set of letter-sound relationships that are organized into a logical sequence." It is "explicit" if it provides teachers with "precise directions for the teaching of these relationships" [between sounds and letters] (p. 19).

There is disagreement among researchers about the efficacy of including segmentation of syllables in early literacy instruction. Snow, Burns, & Griffin (1998) reported that "Early studies showed a strong association between a child's ability to read and the ability to segment words into phonemes" (p. 54). In contrast, Adams (1990) concluded that "various methods to teach children how to divide words into syllables have generally produced little measurable improvement either in children's ability to divide new, untrained words into syllables or in their overall vocabulary and reading comprehension scores" (p. 133).

Some researchers, including the NRP, advocate for what is termed "synthetic phonics" (segmenting and blending strategies), although other systematic approaches include "analytic," "analogy-based," "phonics through spelling," and "onset-rime phonics" (Center for the Improvement

of Early Reading, 2001, p. 13). According to Mercer and Mercer (2005), there is valid scientific research to support the alternative strategies. For instance, they provided the following analysis:

> Recent research supports the effectiveness of teaching onset rime, especially for students who experience problems learning to read. Because words are blended and segmented at the onset rime level as opposed to the phoneme level and are taught in the context of word families, this linguistic approach represents a viable alternative to youngsters who have much difficulty with phoneme-level segmentation and blending. When a student fails to identify a word in a word family by using the analogy approach to decoding, he or she can segment and blend at the onset-rime level (p. 304).

O'Connor and Bell (2004) agree that onset rime strategies are a viable alternative: "Research . . . found that onset rime units were more accessible to young children, and instructional studies with students with disabilities . . . also found that onset-rime units were easier to perceive and easier for children to produce" (p. 483).

A major theme of this study, as well as a major emphasis in ELS, is the importance of individualized and/or differentiated instruction. In many cases, scientific research will validate one approach for mainstream learners, but when one reviews the literature on students with disabilities, the scientific research will indicate the ineffectiveness of that approach and validate another. Regardless of the approach, the goal is for students to learn the relationship between sounds and written letters or symbols and to be able to read words in isolation and/or in context. There are undoubtedly many ways to reach that goal—the appropriate one being which one works with which individual learner.

Mercer and Mercer (2005) provided a comprehensive explanation of the importance of explicit instruction for learning disabled students. They equated explicit instruction with "code-emphasis programs." Such programs are "more effective in teaching students to decode and identify words" than the "meaning-emphasis programs" (e.g., whole language and language experience approaches), they stated, and "this foundation of word recognition serves as a springboard for comprehension development" (p. 317). Both the National Research Council (1998) and the National Reading Panel (2000) came down solidly in support of "code-emphasis programs." The Mercers pointed out that these decisions are based on four decades of research (p. 318).

Using these definitions, ELS is a research-based phonics program, because phonics is systematically and explicitly taught or practiced in all of the instructional tasks in the total program. The CEI approach is not

"synthetic phonics," but a combination of "analogy-based phonics," "phonics through spelling," and "onset rime phonics with positive research findings." It is in the Mercers' terms a "code-emphasis program." In ELS students learn phonics by studying word families with similar sounds and spellings, and then they know how to pronounce new words with those same sound and spelling patterns. Teachers/facilitators who determine that a student needs review or initial teaching of segmenting and/or blending are encouraged to provide that individually or in small groups using CEI's Phonemic Awareness Manual.

ELS helps students explore the letter-sound relationships through the SHARE (an acronym for See, Hear, and REspond) activities in each lesson. ELS provides over 200 structured SHARE lessons to support student learning, using multi-sensory processing to ensure that the content and skills move into long-term memory. The majority of sight-sound combinations necessary for spoken and written English were used by CEI to create the ELS lessons. The program begins by forming words with simple patterns and then moves to more complex patterns:

c-v	consonant-vowel	as in "no"
v-c	vowel-consonant	as in "am"
c-v-c	consonant-vowel-consonant	as in "pan"
c-v-v-c	consonant-vowel-vowel-consonant	as in "pain"

Next, developers grouped the words and sequenced them into visual patterns based on the order in which speech naturally develops. The program first introduces plosive sounds, or sounds made with the lips, such as "p" and "b." It goes on to address the more difficult sounds, such as "k" and "g," that students produce with the tongue at the back of the mouth. According to sound patterns, developers then grouped ELS words into six levels:

Level I	Short vowels
Level II	Digraphs
Level III	Long vowels
Level IV	Initial consonant clusters
Level V	Final consonant clusters
Level VI	Triple consonant clusters

This scope and sequence is highly similar to that recommended in Stewart and Cegelka's (1995) guidelines for teaching phonics—as summarized by Mercer and Mercer (2005):

1. Use lowercase letters for beginning instruction.
2. Introduce most useful skills first.
3. Introduce easy sounds and letters first.

4. Introduce new letter-sound associations at a reasonable pace.
5. Introduce vowels early, but teach consonants first.
6. Emphasize the common sounds of letters first.
7. Teach continuous sounds prior to stop sounds.
8. Teach sound blending early.
9. Introduce consonant blends.
10. Introduce consonant digraphs.
11. Introduce regular words prior to irregular ones.
12. Read connected text that reinforces phonics patterns (pp. 298-303).

Letter Recognition. Phonological awareness includes, of course, letter recognition. According to Silliman, Wilkinson, and Brea-Spahn (2004), research studies indicate that "letter recognition was the strongest kindergarten predictor of outcomes in both word recognition and reading comprehension in grades 2 and 4 for many children, including those with an LLD [language learning disability]" (p. 101). The researchers concluded:

> Thus, it is reasonable to assume that preschool-age children who have minimal experiences with letter names either at home, in daycare, or in their therapeutic interactions due to a language-learning delay, are already at a disadvantage when entering kindergarten, because they lack the anchor for the entire reading 'system' (p. 101).

As a part of ELS, the Letter Recognition program is provided for students, regardless of age, who have not acquired this vital skill. Other research, including that from the NRP, follows in Table 16:

Table 16: Research Findings on Letter Recognition

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 2-41	"It is essential to teach letters as well as phonemic awareness to beginners. . . . Shapes, names, and sounds need to be overlearned so that children can work with them automatically to read and spell words."
Shaywitz, Shaywitz, et al, 2004, p. 926	"A number of investigations indicate that in young children letter identification is the strongest predictor of reading ability."

Researcher(s)	Findings/Conclusions
Chard, Simmons, & Kameenui, p. 11	"Very early in the course of instruction, one wants the students to understand that all twenty-six of those strange little symbols that comprise the alphabet are worth learning and discriminating one from the other because each stands for one of the sounds that occur in spoken words."
Snow, Burns, & Griffin, 1998, p. 113	"Among the readiness skills that are traditionally evaluated, the one that appears to be the strongest predictor on its own is letter identification. . . . Just measuring how many letters a kindergartner is able to name when shown letters in a random order appears to be nearly as successful at predicting future reading as is an entire readiness test."
SEDL, p. 11	"Children need letter knowledge in order to be readers, and letter knowledge is a strong predictor of reading success."
SEDL, p. 11	"Letter knowledge significantly influences the acquisition of phonological awareness and phonological processing skills."
SEDL, p. 11	"Letter knowledge should be fluid and automatic."
SEDL, p. 11	"To be fluent at recognizing letters, students need to be familiar with the distinctive features of each letter."

Phonemic Awareness. Phonemic awareness, which is a subcategory of phonological awareness, is "the conscious awareness that spoken language is made up of individual sounds. . . . Phonemic awareness is manifested when a learner exhibits the ability to hear, identify, and manipulate these individual sounds in spoken words" (Mercer and Mercer, 2005, p. 283). Research evidence abounds that phonemic awareness training is "a necessary but not sufficient condition for learning to read" (Mercer and Mercer, 2005, p. 283). The summary of National Reading Panel (2000) findings on phonemic awareness follows:

Table 17: NRP Research Findings on Phonemic Awareness

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 2-3	"These findings show that teaching children to manipulate phonemes in words was highly effective across all the literacy domains and outcomes."
NRP, 2000, p. 2-4	"Effect sizes were larger when children received focused and explicit instruction on one or two phonemic awareness skills than when they were taught a combination of three or more phonemic awareness skills."
NRP, 2000, p. 2-5	"Results of the meta-analysis showed that teaching children to manipulate the sounds in language helps them learn to read."
NRP, 2000, p. 2-5	"Phonemic awareness instruction produced positive effects on both word reading and pseudoword reading, indicating that it helps children decode novel words as well as remember how to read familiar words."
NRP, 2000, p. 2-5	"Phonemic awareness instruction was effective in boosting reading comprehension."

Again, there is no shortage of research on this topic. Snow, Burns and Griffin (1998) arrived at similar conclusions to the NRP in their landmark study for the National Research Council:

> . . . becoming skilled in phonological decoding provides the child with a self-teaching mechanism that, along with oral vocabulary development knowledge and context, is useful for learning to read words that they have previously encountered (p. 57).
>
> The identification of printed words has long been treated as a skill that is essential for novice readers, yet it remains important in skilled adult reading as well and is a necessary (but not sufficient) factor for comprehension (p. 65).
>
> Because the ability to obtain meaning from print depends so strongly on the development of word recognition accuracy and reading fluency, both of the latter should be regularly assessed in the classroom, permitting timely and effective instructional response where difficulty or delay is apparent (p. 323).

Reid Lyon (1998) weighed in similarly: "This understanding that written spellings systematically represent the phonemes of spoken words (termed the alphabetic principle) is absolutely necessary for the development of accurate and rapid word reading skills" (p. 4).

Other respected researchers agree, as documented in Table 18 below:

Table 18: Other Research Findings on Phonemic Awareness

Researcher(s)	Findings/Conclusions
Sousa, 2001b, p. 91	"Nonetheless, the research is clear: successful reading starts with phonemic awareness of sound-symbol correspondences and the blending of sound-spellings until almost any unknown word can be accurately decoded. Starting with the phonemic awareness approach is one of the few aspects of reading supported by a substantial and long-term body of research."
Adams, 1990, p. 331	"The evidence is compelling. Toward the goal of efficient and effective reading instruction, explicit training of phonemic awareness is invaluable."
International Reading Association, July 1998, p. 3	"Recent longitudinal studies of reading acquisition have demonstrated that the acquisition of phonemic awareness is highly predictive of success in learning to read—in particular in predicting success in learning to decode. In fact, phonemic awareness abilities in kindergarten (or in that age range) appear to be the best single predictor of successful reading acquisition."
International Reading Association, July 1998, p. 5	"There is evidence to suggest that the relation between phonemic awareness and learning to read is reciprocal: phonemic awareness supports reading acquisition, and reading instruction and experiences with print facilitate phonemic awareness development."

Researchers	Findings/Conclusions
NRP, 2000, p. 2-5	"PA instruction helped all types of children improve their reading, including normally developing readers, children at risk for future reading problems, disabled readers, preschoolers, kindergartners, 1st graders, children in 2nd through 6th grades (most of whom were disabled readers), children across various SES levels, and children learning to read in English as well as in other languages."
Alliance for Excellent Education, Jan. 2004, pp. 2-3	"Skills related to the alphabetic principle, such as phonemic awareness, the ability to manipulate the sounds of oral language and phonics, and the relationship of letters to sounds, are often thought of as skills that need to be learned early to prevent reading difficulties later. However, about 10 percent of students enter middle and high school with reading problems that stem from not having mastered the alphabetic principle. There are strategies that are effective with secondary students who struggle with word identification, including: direct instruction. . . ; instruction that focuses on high-frequency, sound-spelling relationships. . .; instruction that offers ample opportunity to practice identification of words in context; and an emphasis on making connections among word analysis, word recognition, and semantics."
NRP, 2000, p. 2-4	"Teaching children to manipulate phonemes with letters exerted a much larger impact on spelling than teaching children without letters."
Chard & Osborn, 1999, p. 6	"There is no set rule about how quickly or how slowly to introduce sound-letter relations. Obviously, it is important to gauge the rate of introduction by the performance of the group of children with whom the program is being used."
Grossen, 2000, p. 7	". . . intensive instruction in sound-spelling relationships during reading was more effective than sound-spelling instruction occurring only during spelling and not during reading."
International Reading Association, July 1998, p. 4	"There is no research evidence to suggest that there is any exact sequence of acquisition of specific sounds in the development of phonemic awareness, only that there is increasing control over sounds in general."
International Reading Association, July 1998, p. 5	"Some research suggests that student engagement in writing activities that encourage invented spelling of words can promote the development of phonemic awareness."
Troia, 2004, p. 271	"Phonological processing is critical for the development of proficient literacy skills, principally because alphabetic orthographies encode lexical entries more or less at the level of the phoneme, the smallest segment of a spoken language's phonological structure that cues meaningful differences between words."
Troia, 2004, p. 280	"The chief problem encountered by children identified with reading disabilities is slow and inaccurate decoding. It is generally assumed that these poor decoding skills are attributable to a core phonological processing deficit."
Troia, 2004, p. 281	"It is unclear just exactly why some children have phonological processing disorders, but impaired perceptual ability has been postulated as a plausible explanation."
O'Connor & Bell, 2004, p. 483	"The benefit of early instruction in phonemic awareness appears to be strongest for children with the lowest initial skill levels."
O'Connor & Bell, 2004, p. 483	"By the end of kindergarten, children who can isolate two or more phonemes in a one-syllable word are unlikely to fall into the bottom 20% of readers at the end of first grade."

It is important to know that phonological deficits are frequently associated with problems in articulation, problems in reception (i.e., confusing "nail" with "mail"), problems in sequencing, and problems in organization (Mercer and Mercer, 2005, p. 212). All these are signals that an appropriate intervention should be provided. ELS provides phonemic awareness instruction within SHARE, Auditory Feedback, and Word Building tasks, among others.

Fluency. Interviews of CEI's educational consultants confirm a belief that one of the things that ELS does best is developing fluency, which then leads to improved comprehension and student interest in reading. They know that when many teachers complain that their students cannot read, they do not necessarily mean that the students cannot decode. Rather, the students lack fluency in word recognition and therefore tie up all their brain resources in sounding out the words in the text, leaving no room for determining meaning. Comprehension just does not occur without fluency. The review of scientific research on this topic confirms the critical importance of fluency development for success in learning and success in reading.

Table 19: Research Findings on Fluency

Researcher(s)	Findings/Conclusions
Snow, Burns, & Griffin, 1998, p. 75	"Gaining fluency in reading entails developing rapid and perhaps automatic word identification processes."
Osborn, Lehr, & Hiebert, p. 4	"Fluency, it seems, serves as a bridge between word recognition and comprehension. Because fluent readers are able to identify words accurately and automatically, they can focus most of their attention on comprehension."
Marzano, 1992, p. 9	". . . for much information to be useful, it must be learned to such an extent that we do not have to think much about it when we use it."
CIERA, 2001, p. 24	"Repeated and monitored oral reading improves reading fluency and overall reading achievement."
Alliance for Excellent Education, 2004, p. 3	"Fluency is the ability to read quickly, accurately, and with appropriate expression, and research shows that good readers are fluent readers. Not surprisingly, students who are not fluent and read very slowly or focus on each word independently, have difficulty comprehending what they read."
Bruer, 1993, p. 189	"Children who can't recognize words automatically can get permanently stuck at the decoding level and may never realize or learn that the goal of reading is to construct meaning."
Bruer, 1992, p. 189	"Across all reading curricula, the contribution of cognitive research has been to underscore the importance of speed and accuracy—automaticity—in word recognition."
Southwest Educational Development Lab, a, p. 3	"The core of reading skill is the ability to identify individual words quickly and accurately."
Adams, 1990, p. 141	"The greater the time and effort that a reader must invest in each individual word, the slimmer the likelihood that preceding words of the phrase will be remembered when it is time to put them all together."

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 3-3	"Children who do not develop fluency, no matter how bright they are, will continue to read slowly and with great effort."
Lyon, Apr. 1998, p. 5	"Although the initial stages of reading for many students require the learning of phoneme awareness and phonics principles, substantial practice of those skills, and continual application of those skills in text, fluency and automaticity in decoding and word recognition must be acquired."
Marzano, Pickering, & Pollock, 2001, p. 140	"Skills are most useful when learned to the level of automaticity."
Thompson & Nicholson, 1998, p. 1	"Research suggests that teaching children to read words quickly and accurately can also increase their reading comprehension."
Bruer, 1993, pp. 187-188	"The researchers measured both accuracy and speed of word recognition by having the children pronounce words as quickly as possible when the words appeared one by one on a computer screen. They found that a first grader's accuracy and speed on this task was an excellent predictor of the child's reading-comprehension scores in fourth grade. They also found that word-recognition speed was a much better predictor of later reading comprehension than accuracy alone. In short, they found that early automaticity of word recognition—speed plus accuracy—precedes, predicts, and so most likely causes subsequent improvement in other reading skills."
Foorman, Fletcher, & Francis, 1996, p. 1	". . . in order to become an efficient decoder, the decoding process must become fast and accurate. Once decoding is efficient, attention and memory processes are freed for comprehension monitoring."
Osborn, Lehr, & Hiebert, p. 8	"With fluency so important to reading success, what can be done to help students become fluent readers? The simple answer is to give them practice, practice, practice, and more practice with reading."
National Study Group, 2004, p. 11	". . . somewhere between fourth and eighth grade there is a shift from learning to read to reading to learn. But, this shift only occurs after—and if—reading becomes a practiced, automated skill. Until this happens, limitations in working memory capacity are too great to permit the interaction between syntactic, semantic, and pragmatic information that is necessary for comprehension. It is only after reading becomes more automatic and there is excess working memory capacity that comprehension becomes the primary task of reading."
Sticht, 1997, p. 3	"To efficiently read and comprehend, the decoding aspect of reading must become automatic, that is, performed without conscious attention. This can be accomplished by hours and hours of practice in reading. This is one of the reasons why adults who leave literacy programs having completed just 50 to 100 or so hours of instruction do not make much improvement in general reading comprehension: they have not automated the decoding process."
Thompson & Nicholson, 1998, p. 1	"The theory behind fast and accurate word reading is that good readers are very good at reading words. They have over-learned this skill through much reading practice. As a result, like skilled musicians and athletes, they have developed automaticity, as a result of many hours of word reading practice. What this means is that they have over-learned word reading skills to the point where they require little or no mental effort. As a result, they are able to put all their mental energies into reading for meaning."

Researcher(s)	Findings/Conclusions
Samuels, 2002, p. 173	". . . students who encountered 10 repetitions of a word while reading acquired more word knowledge than did students who encountered the same word only twice."
Samuels, 2002, p. 174	"Other research evidence also shows that repeated exposures to the same words leads to improvements in fluency."
Lyon, Apr. 1998	"Children vary in the amount of practice that is required for fluency and automaticity in reading to occur. Some youngsters can read a word only once to recognize it again with greater speed; others needs more than 20 or more exposures. The average child needs between four and 14 exposures to automatize the recognition of a new word."
Jackson & McClelland, 1979, p. 181	"Regression analyses suggested that the ability to comprehend spoken material and speed of accessing overlearned memory codes for visually presented letters represented two important independent correlates of reading ability in our samples of subjects. . . . The results supported the conclusion that one skill allowing fast readers to capture more information from each reading fixation is faster access to letter codes from print."
Mercer & Mercer, 2005, p. 286	". . . current research supports fluency training regardless of the cause of the reading disability. . . . Fortunately, fluency instruction appears to be a promising intervention for students with and without reading problems."

This sample of research on fluency provides the scientific evidence that the inclusion of fluency as an emphasis in ELS is a more-than-sound decision, and it also verifies the efficacy of the methodologies used for students to acquire fluency.

Fluency is developed through the ELS program in myriad ways—through multi-sensory processing strategies that facilitate the movement of learning into long-term memory, through repetition and practice in the diverse and plentiful ELS tasks and in the built-in repetition of lessons until students achieve mastery, through specific ELS tasks—such as Auditory Feedback, See Say, Echo, Quick Talk, Fluency Passages, and Long Term Recall.

Vocabulary. A major strength of ELS is that it explicitly teaches more than 2,000 vocabulary words very effectively. Countless other words are taught as well through the definition sentences and the words used in context sentences. Not only is there adequate repetition of the sound and spelling of each of the lesson words, but there are varied and plentiful practice exercises that deeply embed the meaning of a word in a student's long-term memory. ELS's emphasis on vocabulary helps improve foundational comprehension skills, especially critical for at-risk learners. Reid Lyon (Apr. 1998) testified to Congress that "Good comprehenders also have good vocabularies, since it is extremely difficult to understand something you can not define" (p. 6).

The very influential NRP, as well as scores of other researchers, have taken a look at the importance of vocabulary development and have declared it to be one of most critical components in teaching students to think and read.

Table 20: Research Findings on Vocabulary

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 4-4	"Vocabulary instruction leads to gains in comprehension."
NRP, 2000, p. 4-9	"Vocabulary is one of the most important areas within comprehension and should not be neglected."
Bruer, 1993, p. 190	". . . investing in early and consistent vocabulary instruction should, like compound interest, pay long-term dividends for reading comprehension."
Snow, Burns, & Griffin, 1998, p. 322	"Comprehension can be enhanced through instruction that is focused on concept and vocabulary growth and the syntax and rhetorical structures of written language."
Adams, 1990, p. 146	"Does provision of vocabulary instruction generally result in an increase in students' word knowledge? The answer to this question was a definite yes. Across studies, whether outcomes tests measured children's knowledge of word definitions . . . or usages . . ., children who had received instruction on the tested words significantly outperformed those who had not. In addition, children who had received vocabulary instruction significantly . . . outperformed the others on global vocabulary measures, such as standardized tests, indicated that vocabulary instruction effectively enhanced learning of words that were not explicitly taught as well."
Kamil, 2004, p. 10	"The importance of a strong oral-language vocabulary is . . . critical to learning to read."
Marzano & Kendall, 1999, p. 146	"Research . . . indicates that even when there is no attempt to ensure that the words students are taught are ones they will need to know when learning new content, the effect on their achievement is substantial."
Hart & Risley, 1995, p. 160	"We were awestruck at how well our measures of accomplishments at 3 predicted measures of language skill at 9-10. From our preschool data we had been confident that rate of vocabulary growth would predict later performance in school; we saw that it does."
Hart & Risley, 1995, p. 160	"Vocabulary use at 3 was also strongly associated with reading comprehension scores on the Comprehensive Test of Basic Skills."
Lehr, Osborn & Hiebert, p. 20	"Attention to vocabulary development is important for all students, but is especially important for students who are at risk for learning to read and those who are ELLs."
Graves & Watts-Taffe, 2002, p. 145	". . . there is increasing evidence that lack of vocabulary is a key component underlying school failure for disadvantaged students. . . . We include word consciousness in our vocabulary program because it is crucial to do everything possible to shore up students' vocabularies, particularly the vocabularies of disadvantaged students."

Researcher(s)	Findings/Conclusions
American Educational Research Association, Winter 2004, p. 2	"English-language learners will never catch up with native speakers unless they develop a rich vocabulary. Native speakers typically know at least 5,000 to 7,000 English words before kindergarten—a huge vocabulary, as anyone who has struggled to learn a second language knows. English-language learners not only must close that initial gap, but also keep pace with the native speakers as they steadily expand their vocabularies."
Mercer & Mercer, 2005, p. 289	". . . interventions that engage students interactively with memory devices . . . and graphic depictions. . . and are paired with direct instruction appear most promising in promoting vocabulary learning. They also note that students should have multiple exposures to words across time to promote understanding. . . ."

The research syntheses and individual studies that were reviewed as background for this study generally concentrated on the *importance* of teaching phonics, phonemic awareness, and fluency, but did not provide much specificity about methodology. In contrast, there is a plethora of research on the *methods* of teaching vocabulary and comprehension strategies (closely connected), probably because they are so important for all learners. Summaries follow in Table 21.

Table 21: Research Findings on Methods of Teaching Vocabulary

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 4-4	"Dependence on a single vocabulary instruction method will not result in optimal learning. A variety of methods was used effectively with emphasis on multimedia aspects of learning, richness of context in which words are to be learned, and the number of exposures to words that learners receive."
NRP, 2000, p. 4-4	"Repeated exposure to vocabulary items is important for learning gains."
NRP, 2000, p. 4-4	"Repetition and multiple exposure to vocabulary items are important. Students should be given items that will be likely to appear in many contexts."
Bruer, 1993, p. 193	"The research team developed an experimental vocabulary program on four assumptions: Training in word use must be broad. Students must actively process the words. Students must practice extensively with the words. Students must have multiple exposure to the words in different contexts. . . . It worked in part because it embedded vocabulary instruction in the larger context of language comprehension."
Marzano, 1992, p.76	". . . a growing body of research indicates that classification emphasizing semantic feature analysis is a powerful tool for learning vocabulary."

Researcher(s)	Findings/Conclusions
Lehr, Osborn & Hiebert, p. 10	"Research indicates that the intentional, explicit teaching of specific words and word-learning strategies can both add words to students' vocabularies . . . and improve reading comprehension of texts containing those words. . . . Whereas intention instruction can benefit all students, it is especially important for students who have not developed the decoding and comprehension skills necessary for wide reading."
Lehr, Osborn & Hiebert, p. 3	"Estimates vary, but reviews of classroom intervention studies suggest that, in general, no more than 8 to 10 words can be taught effectively each week. This means that no more than approximately 400 words can be taught in a year."
Ghadirian, 2002, p. 149	". . . a word needs to be encountered at least five times in order to be well retained."
Ghadirian, 2002, p. 162	". . . the minimum number of exposures necessary for learning is dependent on the student's prior vocabulary size, the reasoning being that if the reader is familiar with the words surrounding the word in question, then the exposure will lead to better acquisition."
Samuels, 2002	". . . students who encountered 10 repetitions of a word while reading acquired more word knowledge than did students who encountered the same word only twice."
Wolfe, 2001, p. 187	"Vocabulary review is more fun when the meanings of words are tested in game format."
Marzano, Pickering, & Pollock, 2001, p. 124	"Students must encounter words in context more than once to learn them. . . it isn't until exposures reached six that students began to learn and recall new words."
Kamil, 2004, p. 11	"Students will learn better if they are actively engaged in the task of inferring vocabulary meanings from context, rather than simply being given the definition."
Southwest Educational Development Lab, a, p. 15	"A variety of methods for increasing vocabulary is more effective than a single method."
Schmoker, 1999, p. 103	"Even monitoring the number of vocabulary words students master can correlate to reading ability. Interestingly, the number of vocabulary words students learn—through direct instruction—can have a powerful impact on reading ability. . . . As Marzano and others point out, to learn vocabulary is to learn concepts—which enlarges learning capacity."
Adams, 1990, p. 147	"What kinds of vocabulary instruction are most effective? Across studies, methods in which children were given both information about the words' definition and examples of the words' usage in contexts resulted in the largest gains in both vocabulary and comprehension measures."

Graves and Watts-Taffe (2002) provided a summary of effective vocabulary instruction that can also serve as a description of exactly what ELS does: "Vocabulary instruction is most effective when learners are given both definitional and contextual information, when learners actively process the new word meanings, and when they experience multiple encounters with words" (p. 143). Because ELS instruction is totally individualized, as many repetitions or exposures as needed by any one student can be provided and, at the same time, ensure that there is an

optimal number of exposures in the SHARE exercises for any student. In Look Listen See Say, a SHARE activity, learners receive the target word definition and, if desired, an illustration and context sentence to provide a robust context for the learning of new vocabulary.

ELS, then, with its focus on vocabulary development, is reflective of the scientific research that verifies the importance of this component, not only for all students, but especially for those who are disadvantaged, at-risk, and English-language learners. Hart and Risley's (1995) dramatic study, quantifies educators' challenges in this area:

> A linear extrapolation from the averages in the observational data to a 100-hour week . . . shows the average child in the professional families provided with 215,000 words of language experience, the average child in a working-class family provided with 125,000, and the average child in a welfare family provided with 62,000 words of language experience (p. 197).

Comprehension. As discussed previously, ELS does not explicitly teach comprehension strategies that support students' construction of meaning from texts beyond the sentence level. Practice is provided in longer texts, but not direct instruction in comprehension strategies since ELS's focus is on the development of basic or foundational skills. Unless a learner has the foundational and prerequisite comprehension skills, he or she will never be able to perform independently the more advanced tasks. Mercer and Mercer (2005) pointed out that the 481 studies reviewed by the NRP identified comprehension strategies "that appear to have a solid scientific basis for students without reading disabilities" (p. 290). ELS, then, teaches what learners need in order to access texts to be able to move into those other advanced strategies. It especially focuses on the areas of decoding and word recognition, vocabulary, and fluency development. The scientific research that supports these approaches is summarized in three separate tables below.

Table 22: Research Findings on Decoding Influence on Comprehension

Researcher(s)	Findings/Conclusions
McGuinness, 1997, p. 275	"Reading comprehension across the two years was strongly predicted by reading and spelling isolated words, and these in turn were predicted by decoding accuracy, which was predicted by phonemic awareness."
Stuart, 1995, p. 287	"In 90% of cases, the source of reading comprehension problems is poor word recognition skills."
Lyon, Apr. 1998, p. 8	". . . the key to comprehension starts with the immediate and accurate reading of words."

Researcher(s)	Findings/Conclusions
Juel, 1993, p. 95	"In each grade, skill in word recognition was more predictive of reading comprehension than was listening comprehension."
NRP, 2000, p. 2-5	"PA instruction was effective in boosting reading comprehension."
Snow, Burns, & Griffin, 1998, p. 65	"The identification of printed words has long been treated as a skill that is essential for novice readers, yet it remains important in skilled adult reading as well and is a necessary (but not sufficient) factor for comprehension."

Table 23: Research Findings on Vocabulary Influence on Comprehension

Researcher(s)	Findings/Conclusions
NRP, 2000, p. 4-9	"Vocabulary is one of the most important areas within comprehension and should not be neglected."
NRP, 2000, p. 4-4	"Vocabulary instruction leads to gains in comprehension."
Snow, Burns, & Griffin, 1998, p. 322	"Comprehension can be enhanced through instruction that is focused on concept and vocabulary growth and the syntax and rhetorical structures of written language."
Snow, Burns, & Griffin, 1998, p. 62	"Comprehension research has demonstrated clearly the importance of the reader's background knowledge for understanding texts."
Barone, 1998, pp. 62-63	"Children learning to read and write in a second language face additional challenges. . . . The first of these is that they need to learn to manipulate the symbols of the new language. This involves learning to encode and decode these symbols and their combinations for understanding and expressing ideas in reading and writing. Second, students need to learn to transfer their ideas from one language to another. Here students are becoming facile with the phonetic, syntactic, and semantic systems of a new language. The third task involves the transfer of thinking and conceptualizing in a first language to a second language. This can only happen when a student acquires a large vocabulary and an understanding of the structure of a second language."
Bruer, 1993, p. 190	"Investing in early and consistent vocabulary instruction should, like compound interest, pay long-term dividends for reading comprehension."

Table 24: Research Findings on Fluency Influence on Comprehension

Researcher(s)	Findings/Conclusions
Alliance for Excellent Education, Jan. 2004, p. 3	"Fluency is the ability to read quickly, accurately, and with appropriate expression, and research shows that good readers are fluent readers. Not surprisingly, students who are not fluent and read very slowly or focus on each word independently, have difficulty comprehending what they read. Research shows that teaching strategies, such as . . . repeated reading, help improve fluency and comprehension."
Bruer, 1993, p. 189	"Children who can't recognize words automatically can get permanently stuck at the decoding level and may never realize or learn that the goal of reading is to construct meaning."

Researcher(s)	Findings/Conclusions
Bruer, 1993, pp. 187-188	"The researchers measured both accuracy and speed of word recognition by having the children pronounce words as quickly as possible when the words appeared one by one on a computer screen. They found that a first-grader's accuracy and speed on this task was an excellent predictor of the child's reading-comprehension scores in fourth grade. They also found that word-recognition speed was a much better predictor of later reading comprehension than accuracy alone. In short, they found that early automaticity of word recognition—speed plus accuracy—precedes, predicts, and so most likely causes subsequent improvement in other reading skills."

In summary, the Mercers (2005) synthesized comprehension research for students with learning difficulties or disabilities as follows:

> Comprehensive interventions that are most effective support the view that learning disabilities primarily result from language-based inadequacies. For example, individuals with learning disabilities experience difficulties with semantic memory, metacognition, and verbal information processing with top down (i.e., meaning-emphasis) reading approaches. With bottom-up (i.e., code-emphasis) approaches, they tend to struggle with phonemic awareness, sound-symbol connections, and reading fluency. Instruction that targets one or more of these areas generally leads to improved reading comprehension (p. 292).

They added that "the best overall reading comprehension program combines basic reading skills instruction, reading fluency instruction, self-questioning strategies, comprehension monitoring, and encouraging students to view their success as a function of their own efforts" (p. 292). ELS is used, therefore, as a supplement or an intervention in a more comprehensive comprehension program.

Characteristics of Comprehensive Literacy Programs

A comprehensive literacy program teaches more, of course, than phonics, phonemic awareness, fluency, vocabulary, and comprehension. Several books and articles that were reviewed, including the report of the National Reading Panel (2000), included lists and discussions of the components of effective literacy programs for all students, or at least for the mainstream. Those syntheses are documented in depth in this study. ELS, of course, is not a comprehensive literacy program. It is, rather, an intervention for those who struggle and by design does not include every component of a comprehensive program, although it does include instruction in all the critical components.

Of importance to remember as well is that ELS focuses on those prerequisite skills necessary for learning and for learning to read. For example, comprehension is advanced and accelerated in ELS through the expansion of

vocabulary and through enough practice to make decoding automatic—to build background knowledge and for fluency. The regular classroom program with its higher-level comprehension/thinking strategies can then be accessible to the learner who previously struggled. It is counterproductive to insist that a given student be exposed only to instruction that is aligned with the grade-level curriculum standards developed by the state if the student does not know how to learn or know how to read. The foundational knowledge and skills in ELS are, therefore, prerequisite skills for grade-level success.

A summary of the researchers' conclusions about what should be included in a comprehensive literacy program is provided in the following table, along with an indication of the components found in ELS. Schools can use this information to discern the additional content (beyond the five NRP components) included in ELS, as well as to analyze any potential gaps in the general program of the school that need to be filled with other resources.

Table 25: ELS Alignment with Components of Effective Literacy Programs

Desired Component	ELS?	Citations
Letter Recognition	yes	Chard, Simmons, & Kameenui, 1995, p. 11 Honig, 1997, pp. 1-2 Learning First Alliance, June 1998, p. 11 McGuinness, 1997, p. 212 National Reading Panel, 2000, pp. 2-41 Shaywitz, Shaywitz, et al., 2004, p. 926 Snow, Burns, & Griffin, 1998, p. 113 Sousa, 2001b, p. 132 Southwest Educational Development Lab, a, p. 11 Texas Education Agency, 2002, pp. 4-11
Alphabetic Principle	yes	Educational Research Service, 2002, p. 66 Foorman, Fletcher, & Francis, 1996 Honig, 1997, pp. 1-2 Texas Education Agency, 2002, pp. 4-11
Phonological Awareness	yes	American Educational Research Association, Winter 2004, pp. 1-4 Eden, Jones, et al.,Oct. 28, 2004 Foorman, Fletcher, & Francis, 1996 Lachmann, 2002, pp. 174-175 McGuinness, 1997, p. 126 Snow, Burns, & Griffin, 1998, pp. 54, 57, 321 Wise & Olson, 2000, p. 235

Desired Component	ELS?	Citations
Phonics	yes	Adams, 1990, p. 49 Alliance for Excellent Education, 2004a, p. 2 American Educational Research Association, Winter 2004, pp. 1-4 CIERA, Sept. 2001, pp. 13-15 Cooper, Feb. 2005, p. 457 Educational Research Service, 2002, pp. 92-93 Foorman, et al. (1996) Grossen, 2000, pp. 9-13 Honig, 1997, pp. 1-2 Learning First Alliance, June 1998, pp. 12-13 McGuinness, 1997, p. 212 National Reading Panel, 2000 Stahl, 2002, p. 333 Texas Education Agency, 2002, pp. 4-11 U.S. Dept. of Ed., 1986, p. 21
Phonemic Awareness	yes	Adams, 1990, p. 331 Alliance for Excellent Education, 2004a, p. 2 Chard & Osborn, 1999, p. 6 Educational Research Service, 2002, p. 66 Educational Research Service, 2002, pp. 92-93 Foorman, Fletcher, & Francis, 1996 Grossen, 2000, pp. 9-13 Honig, 1997, pp. 1-2 International Reading Association, July 1998, pp. 3, 5 Kamil, 2004, p. 9 Learning First Alliance, June 1998, pp. 11, 14-15 Lyon, Apr. 1998, p. 4 McGuinness, 1997, pp. 131, 212 National Reading Panel, 2000 Sousa, 2001b, p. 91 Torgesen, 2004, pp. 361-362 Texas Education Agency, 2002, pp. 4-11
Orthographic Awareness	yes	Foorman, Fletcher, & Francis, 1996 Grossen, 2000, pp. 9-13 Honig, 1997, pp. 1-2 Learning First Alliance, June 1998, p. 12-13 McGuinness, 1997, p. 212 Sousa, 2001b, p. 121 Texas Education Agency, 2002, pp. 4-11
Fluency	yes	Adams, 1990, p. 141 Alliance for Excellent Education, 2004a, pp. 2, 3 Bruer, 1993, pp. 187-189 CIERA, Sept. 2001, p. 24 Educational Research Service, 2002, p. 66 Educational Research Service, 2002, pp. 92-93 Foorman, Fletcher, & Francis, 1996, p. 1 Jackson & McClelland, June 1979, p. 181 Lyon, Apr. 1998, pp. 5, 6 Marzano, 1992, p. 9 Marzano, Pickering, & Pollock, 2001, p. 140 National Reading Panel, 2000

Desired Component	ELS?	Citations
		National Study Group, 2004, p. 11 Osborn & Lehr, pp. 4, 8 Samuels, 2002, pp. 173-174 Snow, Burns, & Griffin, 1998, p. 75 Southwest Educational Development Lab, a, p. 3 Sticht, 1997, p. 3 Texas Education Agency, 2002, pp. 4-11 Thompson & Nicholson, 1998, p. 1
Vocabulary	yes	Adams, 1990, pp. 146, 147 Alliance for Excellent Education, 2004, pp. 2, 3 American Educational Research Association, Winter 2004, p. 2 Bruer, 1993, pp. 190, 193 CIERA, Sept. 2001, p. 36 Educational Research Service, 2002, p. 66 Educational Research Service, 2002, pp. 92-93 Flippo, 1999, pp. 40-41 Ghadirian, Jan. 2002, pp. 148, 149, 162 Graves & Watts-Taffe, 2002, pp. 143, 145 Hart & Risley, 1995, pp. 160, 197 Honig, 1997, pp. 1-2 Kamil, 2004, pp. 10, 11 Learning First Alliance, June 1998, p. 11 Lehr, Osborn, & Hiebert, pp. 3, 10, 11, 18, 20 Lyon, Apr. 1998, p. 6 Marzano, 1992, p. 76 Marzano & Kendall, 1999, p. 146 Marzano, Pickering, & Pollock, 2001, p. 124 National Reading Panel, 2000 Schmoker, 1999, p. 103 Snow, Burns, & Griffin, 1998, p. 322 Southwest Educational Development Lab, a, p. 15 Texas Education Agency, 2002, pp. 4-11 Wolfe, 2001, p. 187
Comprehension	yes	Alliance for Excellent Education, Jan. 2004, p. 3 Barone, 1998, pp. 62-63 Bruer, 1993, pp. 187-188, 189, 190 Educational Research Service, 2002, p. 66 Educational Research Service, 2002, pp. 92-93 Flippo, 1999, pp. 40-41 Foorman, Fletcher, & Francis, 1996 Honig, 1997, pp. 1-2 Juel, 1993, p. 95 Learning First Alliance, June 1998, p. 11 Lyon, Apr. 1998, p. 8 McGuinness, 1997, p. 275 National Reading Panel, 2000 Snow, Burns, & Griffin, 1998, pp. 62, 65, 322 Stuart, 1995, p. 287 Texas Education Agency, 2002, pp. 4-11

Desired Component	ELS?	Citations
Word Recognition	yes	Alliance for Excellent Education, 2004a, p. 2 Educational Research Service, 2002, p. 66 Educational Research Service, 2002, pp. 92-93 Flippo, 1999, pp. 40-41 Foorman, Fletcher, & Francis, 1996, p. 1 Grossen, 2000, pp. 9-13 Honig, 1997, pp. 1-2 Snow, Burns, & Griffin, 1998, p. 323 Torgesen, 2004, pp. 361-362 Texas Education Agency, 2002, pp. 4-11
Concepts about Print	yes	Honig, 1997, pp. 1-2 Texas Education Agency, 2002, pp. 4-11
Oral Language Development	yes	Honig, 1997, pp. 1-2 Learning First Alliance, June 1998, p. 11 Texas Education Agency, 2002, pp. 4-11
Writing	yes	Adams, 1990, pp. 131, 375 Alliance for Curriculum Reform, 1995, p. 79 Alliance for Curriculum Reform, 1999, p. 61 Barone, 1998, p. 69 Dixon-Krauss, 1996, pp. 105-106 Honig, 1997, pp. 1-2 Levine, 2002, p. 325 Levine & Swartz, p. 3 McGuinness, 1997, p. 276 Southwest Educational Development Lab, a, p. 17 Texas Education Agency, 2002, pp. 4-11 Wolfe, 2001, p. 171
Proofreading	yes	Texas Education Agency, 2002, pp. 4-11

CEI's correlations to the reading and language arts curriculum standards of the various states, which can be retrieved from the webpage, provide further evidence of ELS's alignment with the critical elements of literacy programs.

Writing in the ELS Program

Although writing is not one of the five essential components in a beginning reading program, it is always listed as an essential component in a comprehensive literacy program and in a literacy intervention. Writing is included at a basic level in ELS because a well-integrated program incorporates all four domains of the language arts—reading, writing, speaking, and listening. Writing at various levels is also one of the visual/tactile processing activities by which students can acquire other knowledge and skills, and so is valuable in both the guided practice and independent practice activities. Since ELS is a basic skills program, writing in ELS includes handwriting, spelling, dictation, proofreading, and self-expressive writing through CEI Journal activities. These skills not only benefit general education learners, but also assist in preparing limited-English proficient students for annual assessments to measure growth in English-language proficiency. These tests include all four language arts domains: reading, writing, speaking, and listening.

The validity of including writing in ELS is provided in a number of scientific studies that are referenced in Table 26.

Table 26: Research Findings on Writing

Researcher(s)	Findings/Conclusions
Sousa, 2001b, p. 132	"Many students would like to have better handwriting. Build handwriting instruction into the students' schedule. Provide opportunities to teach them this, keeping in mind the age, aptitude, and attitude of each student."
SEDL, a, p. 11	"To be fluent at recognizing letters, students need to be familiar with the distinctive features of each letter."
Adams, 1990, p. 375	". . . research indicates that children's achievements in reading and writing are generally quite strongly and positively related."
SEDL, p. 17	"Reading and writing develop concurrently and interrelatedly."
Adams, 1990, p. 131	"The value of having the children write and spell is also strongly reinforced. It has been shown that the act of writing newly learned words is a significant strengthening of their perceptual integrity in recognition. This is surely a factor underlying the documented advantages of programs that emphasize writing and spelling activities."
McGuinness, 1997, p. 276	". . . misspelled words can provide important information about whether the child is progressing appropriately in learning sound-to-letter correspondences."
Levine & Swartz, p. 3	"Recent empirical research results that used a multivariate approach to investigate writing suggested that students with dysfunctions of active working memory and expressive language (sentence level) combine to result in written narratives with high rates of spelling errors and poor syntax and semantics."
Wolfe, 2001, p. 171	"Writing activities fit in the category of elaborative rehearsal because they challenge students to clarify, organize, and express what they are learning."
Dixon-Krauss, 1996, pp. 105-106	"Journals and notebooks are a good way for children to begin developing ideas for their writing, as well as showing their understanding about the things that happen in their daily lives, including their school lives."
Barone, 1998, p. 69	"Children who are learning English as a second language need to be provided many opportunities to express themselves in writing."
Alliance for Curriculum Reform, 1999, p. 61	"Effective approaches to the teaching of writing in the [second] language classroom should reflect student needs, abilities, and purposes for writing."
Alliance for Curriculum Reform, 1995, p. 79	"Stressing the processes of composing (planning, drafting, revising, sharing, and publishing) contributes to improved competence in writing."
Learning First Alliance, June 1998, pp. 14-15	". . . while research shows that using invented spelling is not in conflict with teaching correct spelling, the National Academy of Science report does recommend that conventionally correct spelling be developed through 'focused instruction and practice' at the same time students use invented spelling. The Academy report further recommends that 'primary grade children should be expected to spell previously studied words and spelling patterns correctly in final writing products."
Levine, 2002, p. 325	"Creative writing can be an ego oil strike for some students. So many kids have potent feelings and strong views of the world bottled up inside them but discover no expressive channel."

3-Tier Reading Model Alignment

Other literacy models were examined relating to various states' reading improvement initiatives, especially those models aligned with Reading First requirements. One of particular interest, the "3-Tier Reading Model" that was collaboratively developed by the University of Texas Center for Reading and Language Arts and the University of Texas, is used, sometimes with some modification, not only in the Texas Reading First program, but in other states as well. This model, of course, was designed for early literacy programs, but many of its concepts can be applied to later grade levels. It includes a "strong emphasis on methods and strategies grounded in scientifically based reading research and use of assessment instruments, including screening and progress-monitoring measures, and . . . ongoing professional development" (p. i).

Tier I, briefly, is the core classroom instruction in literacy that is provided to all students for a minimum of 90 minutes per day. Tier II provides an additional 30 minutes daily (a total of two hours) of supplemental instruction for those students for whom the core instruction is not enough for them to break the code. ELS is listed in the appendix (G-110) of this publication as a recommended Tier II intervention. Tier III provides explicit, intensive intervention instruction in yet another 30 minutes (a total of two and one-half hours) for those students requiring it. ELS is also listed as a recommended Tier III intervention.

This 3-tier reading model reflects a model developed by Caplan in 1961, as reported by Gaffney (1998). Caplan referred to the three tiers as (1) primary preventive actions, (2) secondary preventions, and (3) tertiary preventions. Gaffney's explanations of the three levels are parallel to those in the 3-tier model.

CEI sees ELS as a potential prevention program at an early grade level in Tier I. ELS is not, of course, a core or comprehensive learning-to-read program, but its use with all students in an early grade level as a supplement to the core would provide appropriate instruction in the basic skills to help prevent the identification of students at Tier II and/or Tier III levels and could, potentially, reduce the number of students who would require Title I targeted assistance or special education services. ELS would also benefit English-language learners. The illustrations that are presented along with the vocabulary/spelling words, the pronunciation of English sounds and words on the computer, the spelling practice, plus the learning to read skills are all research-based strategies to use in any language acquisition program.

As noted above, the 3-Tier Reading Model explicitly includes ELS among several programs recommended as interventions at both Tier II and Tier III. Tier II, which is also a special education pre-referral level, requires supplemental instruction that redirects off-task behaviors, provides students with positive feedback, and effectively communicates expectations, according to the definition. The definition also specifies that instruction must be systematic and explicit and should match

students' skill levels. The selected intervention must provide multiple opportunities for students to practice and respond and to receive corrective feedback. ELS does all those things, as documented in this study.

Tier III is yet a more intensive intervention for students who continue to struggle after a semester of Tier II supplemental instruction. Tier III may apply to regular education students who continue to struggle, or it can work in conjunction with special education. Again, ELS is recommended as a Tier III intervention because of its research-based content, skills, and strategies.

This 3-Tier Reading Model is a good one for all schools to consider, even at the secondary level. It recognizes that some struggling learners will acquire the necessary knowledge and skill through the research-based core program and its supplements to learn how to read, write, speak, and listen. Others will make that leap with more time and more attention paid to specific areas of weakness. There are increasing percentages, however, of students who have either an environmental difficulty, an acquired deficit, or physiological disability that precludes their success without explicit, intensive intervention. These are the economically disadvantaged, limited English, disabled, and/or minority children that no one in America is willing to leave behind.

K-3 Core Reading Programs

Many states are using in their Reading First programs an evaluation instrument for selecting core reading programs that was designed by Simmons and Kame'enui (March 2003) of the University of Oregon. CEI makes available to schools applying for Reading First funding a copy of the completed document, showing how ELS is aligned with the five reading components identified by the NRP as critical in early reading, as well as specifically how those components, as well as others, are taught in the ELS tasks. Appendix C includes a response to one of the Reading First program evaluation instruments for selecting reading software interventions.

Summary

This chapter established that ELS is grounded in scientifically-based research in several areas. First, it includes an important and research-based role for the teacher/facilitator in the operation of the lab. Second, its lesson phases composed of instruction, practice, and assessment are derived from research. Third, its lesson models incorporating the elements of direct instruction, mastery learning and one-to-one tutoring are all thoroughly researched and found to be effective, especially for at-risk learners.

ELS content, especially the five components of phonics, phonemic awareness, fluency, vocabulary, and comprehension are research based and aligned with federal requirements. In addition, ELS includes the basic skills and knowledge

for all the major components desired in a comprehensive literacy program, as derived from research—not just the five identified by the NRP. And, finally, the role that ELS can fill in the 3-Tier Reading Model was described, with emphasis that it is one of the recommended Tier II and Tier III interventions. ELS has also been correlated with the University of Oregon's "Consumer's Guide to Evaluating a Core Reading Program" and to a similar instrument on selecting learning-to-read software (see Appendix C).

Chapter IV: ELS Instructional Strategies

In Chapter II, the scientifically-based research and theory behind multi-sensory processing established ELS as an effective therapeutic intervention for at-risk learners. The research evidence behind its lesson phases, lesson models, and NRP-aligned content was provided in Chapter III, as was a correlation to desired components of comprehensive literacy programs, including the 3-Tier Reading Model.

ELS also includes a number of research-based instructional practices or strategies that are frequently combined in any one task and cut across several tasks to leverage the power of the instructional impact of ELS in improving student performance. Multi-sensory processing (discussed in Chapter II) is one of those. Among others are the following:

- Computer-assisted instruction (CAI)
- Individualized and differentiated instruction (I&D)
- Active engagement and time-on-task (TOT)
- Chunking or clustering (C)
- Repetition and practice (R/P)
- Frequent, multiple assessments and feedback (A&F)

Table 27 below displays the ELS tasks, along with the crosscutting instructional strategies and how they are embedded in individual tasks. Each task, therefore, incorporates those instructional strategies that the designers believed to have the greatest likelihood of effectiveness.

Table 27: Tasks with Embedded Strategies

ELS Task	Embedded Strategies
Letter Recognition	MSP, CAI, I&D, TOT, C, R/P, A&F
Sound Express	MSP, CAI, I&D, TOT, C, R/P,
Phoneme Introduction	MSP, CAI, I&D,
Look Listen See Say	MSP, CAI, I&D, TOT, C
See Hear Spell	MSP, CAI, I&D, TOT, C, A&F
Hear Spell	MSP, CAI, I&D, TOT, C, A&F
Teacher Echo	MSP, I&D, TOT, C, R/P
Auditory Feedback	MSP, CAI, I&D, TOT, C, R/P, A&F
See Say	MSP, I&D, TOT, C, A&F
Echo	MSP, CAI, I&D, C, R/P, A&F
Word Match	MSP, CAI, I&D, TOT, C, R/P, DI
Clues	MSP, CAI, I&D, TOT, C, R/P, DI
Copy-Write	CAI, I&D, C, A&F
Copy-Write-Edit	I&D, A&F
Quick Pick	MSP, CAI, I&D, TOT, C, R/P
Quick Talk	MSP, CAI, I&D, C, R/P
Word Meaning Review	TOT, A&F
Long-Term Recall	MSP, A&F

ELS Task	Embedded Strategies
Fluency Passages	R/P
Word Building Activity	R/P
Clues Activity	R/P
Word Match Activity	R/P
WAC	CAI, R/P, TOT
Quick Tales	R/P
eQuick Tales	CAI, R/P
Picture This	R/P, TOT
Crosswords	R/P, TOT
Word Searches	R/P, TOT
CEI Journal	CAI, TOT, R/P
Sentence Assembler	MSP, CAI, I&D, TOT, R/P

MSP=Multi-sensory processing; CAI=Computer-assisted instruction; I&D=Individualized and Differentiated instruction; TOT=Time-on-Task; C=Chunking or Clustering; R/P=Repetition or Practice; and A&F=Assessment and Feedback

The scientifically-based research on the efficacy of each of these strategies is discussed below. It is important to remember that although the discussion isolates each instructional strategy for analysis, each continually overlaps each other in practice. An analogy is that educators frequently speak of curriculum, instruction, and assessment as if they were three different, discrete things. In the classroom, however, all three go on at once and are truly seamless in effective classrooms.

Computer-Assisted Instruction

The preponderance of evidence in scientifically-based research substantiates the positive role of computer-assisted instruction in teaching the basic skills of reading. The studies referenced in Table 28 indicate that CAI is an effective strategy for diverse reasons:

- facilitates more student-centered classrooms
- is more effective than traditional methods
- is more effective than use of printed materials alone
- permits individualization
- serves to mediate students in their zone of proximal development
- assists students with learning disabilities to learn better
- encourages more time on task
- actively engages students
- is motivating
- develops fluency in reading
- facilitates multi-sensory processing
- provides opportunities for adequate and varied practice
- results in greater gains in variety of basic skills
- facilitates learning English for limited-English proficient students
- is effective with a variety of at-risk learners.

Interestingly, this synthesis of research findings reflects precisely the advantages that CEI's educational consultants report from visits in ELS labs. Further, review of SHARE (CEI newsletter) articles over even one year reveals an abundance of anecdotal evidence from teachers/facilitators, students, administrators, and parents that corroborates these scientific studies. (Past issues of SHARE are available on CEI's webpage and can be searched by keywords relating to diverse population groups and levels of schooling.)

Because of the effectiveness of computer-assisted instruction and its appeal to students, CEI developers expanded its ELS program recently to include a web-based activity center (WAC). WAC makes available online four practice tasks: Picture This, Crosswords, Word Search, and CEI Journal. This new feature makes possible even more repetition and practice on several skills, expands time on tasks, and is motivational. It can be accessed in the lab, at home, or on any Internet-accessible computer. Students work on the activities related to their lesson words, according to individual prescriptions. Also, each time they log on, the crossword puzzle and word search activities change, providing variety for students needing or wanting more practice.

Mercer and Mercer (2005) were among the researchers who synthesized research findings relating to computer-assisted instruction. They noted that "the computer can be used as a tool for classroom management as well as classroom instruction" (p. 67). They continued as follows:

> With computer-managed instruction, teachers can more efficiently develop individualized educational programs and keep records. Computers can store sequences of instructional objectives and student performance information, track student progress, and generate forms and required recordkeeping data (p. 67).

According to the Mercers (2005), the most compelling attributes of computer-assisted instruction (which are also descriptive of ELS) were as follows:

- Instruction is individualized by branching students to items appropriate for them.
- Tasks are analyzed and presented in meaningful sequences.
- Progress is at the student's own rate.
- Reinforcement of individual student responses is immediate.
- Fluency programs enable the student to increase the rate of correct responses.
- Animation, sound effects, and game-playing situations make drill and practice multisensory and motivating.
- A computer is nonjudgmental and allows the student to make mistakes in a nonthreatening environment (p. 67-69).

A sampling of other scientific studies on the efficacy of computer-assisted instruction is provided in Table 28:

Table 28: Scientific Research on Computer-Assisted Instruction

Researcher(s)	Findings/Conclusions
Padron & Waxman, 1999, p. 185	". . . student-teacher interactions were more student-centered and individualized during computer-based teaching and learning than with traditional teaching and learning."
Alvermann, 2001, p. 10	". . . using computer-assisted instruction was more effective than traditional methods."
Mioduser, Tur-Kaspa, & Leitner, 2000, p. 63	"The results showed that the children in the group that received reading instruction with both computer and printed materials showed greater improvement than children who received reading instruction with only printed materials or children in the control group."
Padron & Waxman, 1999, p. 185	". . . high access to computers enabled teachers to individualize instruction more."
Muter, 1996, p. 9	"The use of computers entails huge individual differences, but it also permits extensive individualization."
National Research Council, 1997, p. 131	"Although much has been done in the field of assistive technology, it is in instructional technology that most of the attention has been directed, especially for students with mild disabilities. . . . These applications can help individualize instruction for students with disabilities by adjusting both the presentation mode and the time a student can spend working on any given task."
Dixon-Krauss, 1996, p. 176	"Social processes, necessary in development, can be either facilitated through or imitated by the computer and associated media devices. In other words, computers can act as the 'more competent peer' in some situations, enhancing the zone of proximal development and artificially providing a sociocultural means of mediation."
Sousa, 2001b, p. 210	"Computers and other forms of advanced technology are useful tools for helping students with learning problems."
National Research Council, 1997, p. 129	"A discussion of effective instruction would be incomplete without mentioning the use of technology, which can produce dramatic educational benefits for many students with disabilities both as an assistive device and as an instructional tool."
Padron & Waxman, 1999, p. 185	". . . students who used a computerized integrated learning system in both laboratory and classroom settings were more actively engaged in learning tasks than were students in the non-ILS classrooms."
Alliance for Curriculum Reform, 1995, p. 73	"Learning in which children and young people are interactive produces far more effective growth than instruction in which they are passive."
Kamil, 2004, p. 29	"Methods of maximizing motivation and engagement in adolescents should be a major focus when designing adolescent literacy programs. One such focus should include the integration of computer technologies into literacy instruction."
NRP, 2000, p. 6-8	". . . the motivational aspects of computers should not be overlooked."
Gagne', 1985, p. 193	"Microcomputers seem well suited to stimulating the extensive practice needed to automate a skill."
NRP, 2000, p. 6-8	". . . there were no instructional studies in which the computer did not provide a significant addition to the instructional context."
NRP, 2000, p. 6-8	"When multimedia software is available and appropriate, it should be exploited."

Researcher(s)	Findings/Conclusions
Tileston, 2000, p. 13	"Only about 20% of students learn auditorily; the other 80% learn either visually or kinesthetically."
Geraci, 2002, pp. 3-4	"Learning theories that pre-date the notion of an interconnected system of electronic information presented in sensory-rich units all point to the potential for increased learning inherent in interactive environments that stimulate multiple senses, provide visual feedback, and allow for self-paced discovery."
Sousa, 2001b, p. 98	"Significant progress is being made in understanding the connection between the visual and auditory processing systems during reading. Research-based reading programs that use computers to help students coordinate these systems have substantially benefited slower readers."
Biancarosa & Snow, 2004, p. 19	"As a tool, technology can help teachers provide needed support for struggling readers, including instructional reinforcement and opportunities for guided practice. For example, there are computer programs that help students improve decoding, spelling, fluency, and vocabulary."
NRP, 2000, p. 4-4	"Computer vocabulary instruction shows positive learning gains over traditional methods."
Lehr, Osborn, & Hiebert, pp. 17-18	". . . the great potential of computer technology lies in certain capabilities that are not found in print materials, including game like formats. Such formats may be more effective at capturing students' attention than textbooks and workbooks. . . . Devices that allow students to click on words to hear them pronounced and defined may extend students' understandings of new words."
Weller, Carpenter, & Holmes, 1998, p. 834	"This study evaluated the effectiveness of computer-assisted instruction for low-achieving 5th graders. . . . The results showed that the group that received computer-assisted instruction achieved greater gains in reading."
Alliance for Curriculum Reform, 1999, p. 68	". . . use of various forms of technology can result in improved skills in comprehending and producing a second language."
UTRLA & TEA, 2001, p. 9	"Hearing the sounds and expressions used in reading English text may alert English-language learners to intonation patterns that may differ from those of their home language."
Barker & Torgesen, 1995, p. 103	"Results showed that students who received computer-assisted instruction with phonological training made significant gains in word recognition and phonological awareness."
Mitchell & Fox, 2001, p. 332	"The results showed that computer-delivered phonological awareness training can be an effective method of instruction."
Reitsma & Wesseling, 1998, p. 320	"The results showed greater improvement in the blending skills of children who received computer instruction."
Van Daal & Reitsma, 2000, p. 193	"The results showed that practicing spelling on the computers was beneficial for low-motivated students."
Mioduser, Tur-Kaspa, & Leitner, 2000, p. 1046	"Results clearly indicated that children at high risk who received the reading intervention program with computer materials significantly improved their phonological awareness, word recognition, and letter naming skills relative to their peers who received a reading intervention program with only printed materials and those who received no formal reading intervention program."
Chambless & Chambless, 1994, p. 155	"The results indicate that computer-based instruction had a positive effect on the reading achievement of African Americans of low socio-economic status (male and female), white males of low socio-economic status, and white females of high socio-economic status."

Computer Screen Design

When CEI's sales directors are asked about issues or objections raised by potential customers, the topic of the plainness of ELS's screens sometimes comes up. Educators, just as many students, have become used to seeing the busyness of the MTV screen, which has influenced even conservative news networks, such as CNN, to include—all at once—a "talking head," a split-screen video, and a running news summary at the bottom of the screen, plus the current weather information. Educators are also used to seeing computer-assisted instruction that has busy screens, many times including music, animation, and bright colors. The ELS screen, then, in some minds is "too plain Jane" for those seeking "edutainment."

The review of literature, however, on what works in the design of computer screens, especially for students with learning disabilities or difficulties, is loud and clear:

- screens should be uncluttered,
- screens should use simple illustrations that reinforce the instructional goal,
- screens should use color sparingly and consistently, and
- screens should not place too much information on the screen at once.

ELS's screen design consistently reflects this important research. Other examples of how research reported in Table 29 is reflected in the ELS screen design follow: ELS students view text in one type of font, and the program uses few icons and buttons. Important information is strategically placed with careful attention to providing sufficient black space.

ELS 7.0 contains some changes in response to customer requests for more engaging screens. All the drawings were updated, and introductory screens to the lessons now have colorful scenes in the background, "but not in the lesson presentation screens," according to David Merryweather, vice president for research and development, "in order to avoid distracting the learners."

Table 29 includes, to a large extent, findings from a meta-analysis conducted by Geraci (2002), but also several other individual studies.

Table 29: Research Findings on Effective CAI Screen Design

Researcher(s)	Findings/Conclusions
Geraci, 2002, p. 5	"In the context of computer-based education, visual design is said to have five primary functions: (1) focusing attention, (2) developing and maintaining interest, (3) promoting deep processing, (4) promoting engagement, and (5) facilitating navigation through the content."
Geraci, 2002, p. 5	". . . the visual design of computer-based instruction plays a crucial role in learner comprehension, and retention of online content . . . and is also central to the learner's motivation to engage themselves in the content."
Geraci, 2002, pp. 65-66	"The literature in the field of screen design for instruction generally agrees that when attention is given to the visual presentation of information on the screen, there is an increase in the level to which learners understand and retain the content, and the rate at which they complete instructional units is accelerated."
International Dyslexia Association, 2002, p. 2	"Block out extraneous stimuli. If a student is easily distracted by visual stimuli on a full worksheet or page, a blank sheet of paper can be used to cover sections of the page not being worked on at the time."
Babbitt, 2004	"Most students with learning disabilities are distracted by too much stimuli coming at them at the same time. Moreover, cluttered screens often distract from the . . . concept of procedure being studied."
Smey-Richman, 1988, pp. 19-20	". . . any skill is learned best when the learners are not distracted by other inputs competing for attention."
Geraci, 2002, p. 71	". . . there were two dominant themes in nearly all the selected literature: consistency and simplicity."
Robertson & Hix, 2002, p. 172	"Lack of screen clutter and a logical, open path of movement proved more important than direction of movement."
Robertson & Hix, 2002, p. 172	"Minimize use of icons and other screen clutter."
Davies, Stock, & Wehmeyer, 2002, p. 211	"There are a number of parameters that need to be considered when examining the utility of computer assisted training and support. Okolo, Bahr, and Rieth (1993) reviewed research on computer assisted instruction for students with limited support needs, and identified a list of features for effective software that included: • Clear, uncluttered screens • Consistent commands and features from screen to screen • Appropriate sequencing and pacing • A full range of appropriate examples • Allow students to respond at a high rate • Graphics and animation that contribute to, rather than distract from, learning • Frequent, informative feedback • Adequate number of opportunities for practice • Multiple exposures to a word or a fact."
Levin & Long, 1981, p. 32	". . . simplicity of pictorial presentation facilitates learning. Pictures need to draw the attention of students precisely to those aspects of learning required by the instructional goal."

Researcher(s)	Findings/Conclusions
Adams, 1990, p. 367	"In general, information that is illustrated tends to be better remembered, particularly at the level of details. In addition, illustrations appear to be an effective means of inserting information that is consistent with but supplementary to the text."
National Research Council, 1999, p. 112	". . . comparisons of people's memories for words with their memories for pictures of the same objects show a superiority effect for pictures. The superiority effect of pictures is also true if words and pictures are combined during learning. Obviously this finding has direct relevance for improving the long-term learning of certain kinds of information."
Muter, 1996, p. 2	"Much of the published research on optimization of reading has been done with paper media. Research on reading from paper media has yielded the following results: • Upper case print, italics, and right justification by inserting blanks result in slower reading. • Black characteristics on a white background produces faster reading than the reverse, and most readers prefer it. • There is no effect of margins, serifs, or typeface in general, within reasonable limits. • Effects of type size, line length, and interline spacing interact."
Muter, 1996, p. 4	"The tendency to overuse color (the 'fruit salad' approach) can clutter up the screen and create confusion."
Muter, 1996, p. 5	"Evidence suggests that a large majority of users prefer positive polarity (dark characters on a light background). In theory, positive polarity reduces optical distortion, and increases visual acuity, contrast sensitivity, speed of accommodation, and depth of field."
Geraci, 2002, p. 43	"Among all this conjecture into the use of color, a few pertinent points did surface in the literature with near unanimity. Chief among these is that designers should use color judiciously. Many references contend that there is diminishing return as the number of colors used in a single screen increases. The notion that color should be used in a consistent fashion also appeared throughout the literature."
Geraci, 2002, pp. 44-45	"A good way to avoid color distraction is to use colors found in nature, particularly toward the lighter side, such as grays, blues, and yellows of sky and shadow. Nature's colors are familiar and have a widely accepted harmony."
Geraci, 2002, p. 49	"Color affects the coding of information in human memory. Even if the colors chosen do not contribute to the message content, color can nevertheless still facilitate the retrieval of essential learning cues. Recommendations on the appropriate number of colors to use on a single screen range from 2 to less than 10."
Geraci, 2002, p. 49	"Too much color can be distracting and has been shown to degrade performance on memory and recognition tasks."
Geraci, 2002, p. 56	". . . screens should be designed with attention to balance, harmony, and unit."
Geraci, 2002, p. 67	"The literature makes unanimous calls for a consistent use of color in computer-based instruction. Remaining true to one's use of color provides a reliable context or information that eases the learning process and lets the user focus on the information and not the construct of the interface."
Geraci, 2002, p. 56	". . . consistency in layout is also widely believed to have great importance in the design of screens."

Researcher(s)	Findings/Conclusions
Geraci, 2002, p. 63	"One of the most fundamental dictates of good screen design is consistency in the placement of various items, use of color, access structure, style of graphics, screen density and white space."
Geraci, 2002, p. 63	"Strive for consistency in menus, help screens, color, layout, capitalization, fonts, and sequence of actions."
Geraci, 2002, p. 69	"Spatial layout has the important role of creating a visual gestalt, or underlying pattern to the information that allows the learner to build a mental scheme for grouping and processing the lesson's content."
Geraci, 2002, p. 70	"Here too, the literature was nearly unanimous: paging is preferred to scrolling."
Geraci, 2002, p. 70	"Most of the research into screen density is founded upon the notion that users can become overwhelmed with long, continuous presentation of information. Research on memory load generally holds that students need to receive information in smaller, more digestible chunks, which promote the formation of concept building and associations in the learner's minds."
Geraci, 2002, p. 53	"Select a typeface with a simple, clean style and use a few typefaces in any one screen or program."

Individualized and Differentiated Instruction

". . . no study has ever identified an educational treatment that has worked effectively for all participants." –Allington, Feb. 2005, p. 463

Along with multi-sensory processing and computer-assisted instruction, another critically important feature of ELS is its high degree of individualization and differentiation. The design of the program allows each student to have a unique prescription and then to proceed at his or her own pace through the program. ELS facilitates individualization and differentiation through computer-assisted management, which through the CEI Learning Manager, keeps track of a student's placement in the program, his or her daily progress, levels of mastery, and when and if recycling is needed. The lesson sequences are different, depending upon the diagnosed needs of each student. Frequent assessments allow the teacher constantly to monitor progress and to adapt and adjust the prescription (both the levels and the lesson settings or parameters) to ensure high levels of success with an appropriate degree of challenge. It also has an "early warning system" that annotates the student progress printouts with suggested modifications to lesson sequences or tasks.

Individualization and differentiation are critically important, according to the scientific research cited in Table 30, for there is great diversity in the age, ability, and needs of the range of at-risk learners that are described in Chapter II. Also, for those who know Lev Vygotsky's work, delivering instruction in what he called the "zone of proximal development" is necessary for effective learning (Dixon-Krauss, 1996, p. 14). That zone, which changes frequently, is the area in which a learner can perform with the help of an expert peer or adult mediator—or a computer. Once the learner can perform independently, he or she has moved out of the previous zone and is ready for the next challenge in a new zone.

Given the power of individualization and differentiation, education practice is apparently moving to individual education plans for all students, not just those in special education. Increasingly, especially for at-risk students, but even for gifted/talented students, there are legislative mandates for individual plans. Arkansas is an example. Their comprehensive legislation that was designed to revise their former state accountability system to comply with NCLB, included several requirements related to the provision of a student academic improvement plan (SAIP) for all students failing a portion of the state assessments. The table below displays those requirements, along with ways in which ELS implementation can assist a school or district in compliance, as well as effectiveness in improving achievement.

Table 30: ELS Correlation with State Mandate for Individualization

ADE ACTAAP Rules	CEI's Role
7.04 Beginning with the 2004-05 school year, any student failing to achieve at the proficient level on the State mandated CRT, that student shall be evaluated by school personnel, who shall jointly develop, with the student's parents, **a student Academic Improvement Plan (AIP)** to assist the student in achieving the expected standard in subject area(s) where performance is deficient.	**CEI's** ELS program is highly recommended as the school's intervention strategy for all students failing to achieve at the proficient level in language arts. The third-party assessments provided with the program will provide additional diagnostic data to determine student strengths and weaknesses. The program is both highly individualized and will enable schools through one intervention to meet the diverse needs of students failing to perform well. Further, the program enables staff to monitor student progress frequently and to make adjustments in the student's program for improved learning. Summative data will help the school predict achievement on the state benchmarks.
7.04.2 The AIP shall be developed cooperatively by appropriate teachers and/or other school personnel knowledgeable about the student's performance or responsible for the remediation in consultation with the student's parents. An **analysis of student deficiencies** based on test data and previous student records shall be available for use in developing the Plan. The Plan shall be signed by the appropriate school administrator and the parent/guardian.	In addition to the state scores on previous assessments, student grades, and other available records, **CEI** school partners will also have at their disposal the results of the DSTR and the LET-II, both of which will enable them to diagnose "student deficiencies" and then to prescribe appropriate instruction. The ELS Placement Test will assist the committee to place the student at the appropriate level of lessons to maximize the time spent.. **CE**I's parent awareness session will enable parents of students served to understand the program and how it will benefit their child.

ADE ACTAAP Rules	CEI's Role
7.04.3 The AIP should be flexible, should contain **multiple remediation methods and strategies, and should include an intensive instructional program** different from the previous year's regular classroom instructional program. Examples of strategies and methods include, but are not limited to, computer assisted instruction, tutorial, extended year, learning labs within the school day, Saturday school, double blocking instruction in deficient areas during the school day, etc.	**CEI**'s ELS program is expressly designed to provide "multiple remediation methods and strategies" that are well grounded in scientifically-based evidence. ELS is an "intensive instructional program" that serves as an intervention and is, therefore, different from regular classroom instruction. ELS uses multi-sensory processing to get at the source of most reading difficulties or disabilities and, thus, is a therapeutic intervention. The strategies used in these programs enable schools to use the programs in a variety of ways: Computer assisted instruction Tutorials Extended year Learning labs Saturday school Before/after school Double blocking **CEI** recommends that students be engaged in the ELS program for at least 45 minutes each day for at least 4 days a week for maximum benefit.
7.04.4 The AIP shall **include formative assessment strategies** and shall be revised periodically based on results from the formative assessments.	Built into the management of ELS is a formative assessment system that requires the teacher to daily and periodically evaluate progress and to make appropriate adjustments to the student's program of lessons.
7.04.5 The AIP shall include standards-based **supplemental/remedial strategies** aligned with the child's deficiencies.	ELS provides the necessary remediation to address the learning deficiencies of most children "with educational differences."
7.04.6 **A highly qualified teacher** and/or a highly qualified paraprofessional under the guidance of a highly qualified teacher shall provide instructional delivery under the AIP.	An ELS lab may be staffed by a highly qualified teacher or by a highly qualified para-professional under the guidance of a highly qualified teacher. About 60% of **CEI**'s school partners assign paraprofessionals to their labs.
7.04.7 The **AIP should be individualized**; however, similar deficiencies based on test data, may be remediated through group instruction.	ELS is totally individualized, so a diverse group of students can all be served effectively in one lab.
7.05 Retention for failure to participate in the Academic Improvement Plan 7.05.5 Any student who does not score at the proficient level on the criterion-referenced assessments in reading, writing, and mathematics shall continue to be provided with remedial or supplemental instruction until the expectations are met or the student is not subject to compulsory school attendance.	ELS is highly motivating since instruction is carefully scaffolded for participating students to ensure that they experience a reasonable degree of success, which encourages them to stay on task.

The table below cites those studies that relate to the efficacy of individualization and/or differentiation in teaching.

Table 31: Research Findings on Individualized and Differentiated Instruction

Researcher(s)	Findings/Conclusions
IRA, 2001, p. 8	"Children learn to read and write at different rates and in different ways. There are significant numbers of children who struggle with reading and writing. Many of these children need more and different kinds of instruction, and they have a right to instruction that is designed with their specific needs in mind."
Flippo, 1999, p. 48	"Readers should note that throughout the process of seeking agreements, the experts, regardless of their perspective, always refrained from endorsing or suggesting any one particular method or approach to teaching reading. Clearly, they know, as major respected studies have suggested, there is no one method or approach that is best for all children in all situations."
Flippo, 1999, p. 64	"As we as a nation struggle with the best ways to teach reading, we must recognize that Michelle is different from Marneka; Marneka is different from Nicole; Nicole is different from Paul; Paul is different from Adrian. Therefore, . . . we must use a variety of methods. . . . We must provide a variety of reading experiences, including vocabulary instruction, word analysis, phonics for some students, and comprehension instruction."
Van den Broek, 1996, p. 194	". . . the debate between proponents of phonics and those of whole language pit two one-fits-all programs against each other. Both common sense and the results of research . . . show the fruitlessness of such a debate between extremes. Sadly, of course, students with different needs and different strengths and weaknesses are the victims of such polarized debates."
Van den Broek, 1996, p. 195	" . . . it becomes clear that one-fits-all instructional techniques have reached the end of their effectiveness. Beginning readers are individuals with enormously varying constellations of skills and weaknesses. Educational programs should reflect this richness and variety rather than attempt to mold every child into the same instructional straightjacket."
Sousa, 2001b, p. 208	". . . it is important to remember that students with learning problems can learn when teachers spend the time and use their expertise to find the appropriate ways to teach these students."
Sousa, 2001b, p. 208	"Learn about learning. Educators in all areas need to update their knowledge base about what neuroscience is revealing about how the brain learns. These discoveries and insights can help explain problems and improve classroom skills. Teachers should draw on the knowledge of special educators and researchers to address specific problems."
Short & Echevarria, Dec. 2004/Jan. 2005, p. 9	"We do English-language learners a disservice if we think of them as one-dimensional on the basis of their limited English proficiency."
Reis, Kaplan, et al, Nov. 1998, p. 75	". . . recent research indicates that only a small number of teachers offer differentiation in their classroom."

Researcher(s)	Findings/Conclusions
Dixon-Krauss, 1996, pp. 14-15	"Vygotsky believes that good instruction is aimed at the learner's zone of proximal development. He describes the zone of proximal development as encompassing the gap between the child's level of actual development determined by independent problem solving and her level of potential development determined by problem solving supported by an adult or through collaboration with more capable peers."
Dixon-Krauss, 1996, p. 31	"For emerging readers, selecting text that is within their zone of proximal development is essential."
Tomlinson, 2001, p. 1	"At its most basic level, differentiating instruction means 'shaking up' what goes on in the classroom so that students have multiple options for taking in information, making sense of ideas, and expressing what they learn. In other words, a differentiated classroom provides different avenues to acquiring content, to processing or making sense of ideas, and to development products so that each student can learn effectively."
Tileston, 2000, p. 68	"Through the use of technology, teachers will be more effectively able to monitor and provide anytime, anywhere assistance to students."
Kamil, 2004, pp. 29-30	"English-language learners face additional, unique challenges. Policies that guide instruction need to reflect the research that examines the transfer from the first language to second language and ESL teaching strategies."
Hay, 1997, p. 68	". . . effective practice in special education, as measured by teacher decision making about instructional modifications and student achievement in reading, math, and spelling, centers instructional decision making on the individual student. This process is called individually referenced decision making."
Hay, 1997, p. 68	"Although there may be many benefits of using technology to adapt materials for different reading levels, one significant benefit is that children may learn at their own level without the stigma of having been placed in a certain group according to reading ability."
Alliance for Excellent Education, 2004, p. 1	"Programs should be appropriate for both the reading level and the age level of the students involved."

There is also an abundance of research on effective methods of individualizing and differentiating. Those studies are cited in the following table:

Table 32: Research Findings on Individualization and Differentiation Methods

Researcher(s)	Findings/Conclusions
Van Den Broek, 1996, p. 194	"An understanding of the complex interactions in literacy has important implications for educational practice. Perhaps the most important implication is that 'one-fits-all' instructional programs are doomed to fail in practice."
Tomlinson, 2001, p. 1	"At its most basic level, differentiating instruction means 'shaking up' what goes on in the classroom so that students have multiple options for taking in information, making sense of ideas, and expressing what they learn. In other words, a differentiated classroom provides different avenues to acquiring content, to processing or making sense of ideas, and to development products so that each student can learn effectively."

Researcher(s)	Findings/Conclusions
Van Den Broek, 1996, p. 194	". . . the debate between proponents of phonics and those of whole language pit two one-fits-all programs against each other. Both common sense and the results of research . . . show the fruitlessness of such a debate between extremes. Sadly, of course, students with different needs and different strengths and weaknesses are the victims of such polarized debates."
Van Den Broek, 1996, p. 195	". . . it becomes clear that one-fits-all instructional techniques have reached the end of their effectiveness. Beginning readers are individuals with enormously varying constellations of skills and weaknesses. Educational programs should reflect this richness and variety rather than attempt to mold every child into the same instructional straightjacket."
Lyon, Apr. 1998, p. 14	"Instructional questions that reflect on either-or phonics/whole language reading program choice must be replaced by questions that embrace the complexity of reading instruction. For example, for which children are which reading instruction models/approaches/methods most beneficial at which stages of reading development and in which classroom environments?"
Dixon-Krauss, 1996, p. 31	"For emerging readers, selecting text that is within their zone of proximal development is essential."
Dixon-Krauss, 1996, p. 14	"What the child can do in cooperation today he can do alone tomorrow. Therefore, the only good kind of instruction is that which marches ahead of development and leads it; it must be aimed not so much at the ripe as at the ripening functions."
Alliance for Excellent Education, p. 1	"Programs should be appropriate for both the reading level and the age level of the students involved."
Torgesen, 2004, p. 363	". . . the exact mix of instructional activities that is most effective almost certainly varies depending on the individual needs of each child."
Neuman & Roskos, 1998, p. 7	"In their home and preschool experiences, children encounter many different resources and types and degrees of support for early literacy. This means that some children will be better prepared for literacy instruction than others. Consequently, no one method or approach is likely to work for all children. Because children's development varies, so too must our instructional strategies."
Tileston, 2000, p. 68	"Through the use of technology, teachers will be more effectively able to monitor and provide anytime, anywhere assistance to students."
Hay, 1997, p. 68	"Although there may be many benefits of using technology to adapt materials for different reading levels, one significant benefit is that children may learn at their own level without the stigma of having been placed in a certain group according to reading ability."
Hay, 1997, p. 68	". . . effective practice in special education, as measured by teacher decision making about instructional modifications and student achievement in reading, math, spelling, centers instructional decision making on the individual student. . . . This process is called individually referenced decision making."
National Research Council, 1997, pp. 124-125	"Individually referenced decision making is perhaps the signature feature of effective special education practice. . . . Corroborating evidence documents how individually referenced decision making enhances learning for students with cognitive deficiencies. A meta-analysis of a number of studies summarized the efficacy of individually referenced decision making for students with cognitive disabilities (with an effect size of .70 standard deviation units)."

Researcher(s)	Findings/Conclusions
Alliance for Excellent Education, 2004, p. 1	"Programs should be flexible enough to allow for students' different learning styles, abilities, backgrounds, and interests."
National Research Council, 1997, pp. 124-125	"Individually referenced decision making is perhaps the signature feature of effective special education practice."
Torgesen, 2004, p. 363	" . . . the exact mix of instructional activities that is most effective almost certainly varies depending on the individual needs of each child."
Caine & Caine, 1991, p. 13	"The school based on the factory approach fails to prepare students for two reasons. First, the relevant skills and attributes students need for this century and the next tend not to be addressed. Second, the organization and methods of teaching content and skills are inadequate because they fail to take advantage of the brain's capacity to learn."
Neuman & Roskos, 1998, p. 7	"In their home and preschool experiences, children encounter many different resources and types and degrees of support for early literacy. . . . This means that some children will be better prepared for literacy instruction than others. Consequently, no one method or approach is likely to work for all children. Because children's development varies, so too must our instructional strategies."
Lyon, Apr. 1998, p. 14	"Instructional questions that reflect on either-or phonics/whole language reading program choice must be replaced by questions that embrace the complexity of reading instruction. For example, for which children are which reading instruction models/approaches/methods most beneficial at which stages of reading development and in which classroom environments?"
Sousa, 2001b, p. 20	"Students with learning disabilities often exhibit a wide variety of traits including problems with spoken and written language, reading, arithmetic, reasoning ability, and organization skills. These may be accompanied by inattention, hyperactivity, impulsivity, motor disorders, perceptual impairment, and a low tolerance for frustration. Because each of these traits can run the gamut from mild to severe, it is necessary to assess each student's disabilities to determine the best approach for effective teaching."

Active Engagement and Time-on-Task

The scientific research on the importance of student engagement and time-on-task is abundant. The Alliance for Curriculum Reform (1995) documented more than 130 studies that "support the obvious idea that the more students study, other things being equal, the more they learn." They added that "It is one of the most consistent findings in educational research, if not all psychological and social research." But there is a caution in interpreting the findings, they said, "Time alone, however does not suffice. Learning activities should reflect educational goals" (p. 11). Mercer and Mercer (2005) stated in their research synthesis the following:

> The finding that academic learning time is related positively to more student learning is consistent in the research for both general education students and students with learning problems. To foster a positive and productive learning environment, students should

> spend as much time as possible engaged in meaningful academic tasks (p. 34).

Gettinger (1991) found (as quoted in Mercer and Mercer, 2005) that

> . . . students with learning disabilities required significantly more time to achieve mastery on a reading comprehension task than students without learning disabilities. In essence, students with learning problems need ample time for learning, high rates of success, and strategies on how to learn and retain relevant information (p. 34).

These findings emphasize time-on-task and active engagement as being critical for students with learning difficulties. Interestingly, this conclusion is linked with the importance of two other research-based strategies in ELS: high rates of success (see Motivation in Chapter V) and strategies to learn and retain relevant information (see Multi-sensory Processing in Chapter II and other instructional strategies discussed in Chapter IV).

Other researchers' findings are provided in the table below.

Table 33: Research Findings on Active Engagement and Time-on-Task

Researcher(s)	Findings/Conclusions
Snow, Burns, & Griffin, 1998, p. 129	"Time on task is a good predictor of achievement gains."
Biancarosa & Snow, 2004, p. 20	"The panel [on adolescent literacy] strongly argued the need for two to four hours of literacy-connected learning daily."
USDE, 1986, p. 34	"How much time activities are actively engaged in learning contributes to their achievement. The amount of time available for learning is determined by the instructional and management skills of the teacher and the priorities set by the school administration."
Levin & Long, 1981, p. 2	" . . . the 1978 report of the National Academy of Education stressed that 'the answer to the question of how schools can improve educational attainment lies in spending more time on those attainments we value. There is a striking convergence of evidence that points to the role of time-on-task—engaged time—in improving performance in school subject matters."
Gagne', R., 1985, p. 256	"The amount of time devoted to learning may be expected to affect the amount of learning. As a number of empirical studies have shown, the time students spend in actual learning (time on task) is a particularly potent variable in the determination of what is learned, as indicated by student proficiency in school subjects."
Torgesen, 2004, p. 364	"There are essentially two ways to increase intensity of reading instruction in elementary school. Either instructional time can be increased, or instruction can be provided individually or in small groups."

Researcher(s)	Findings/Conclusions
Levin & Long, 1981, p. 2	"Studies . . . generally demonstrate that, within a classroom, students who are more involved in their learning have higher achievement than students who are less involved in classroom learning activities."
Alvermann, 2001, p. 7	". . . the level of student engagement (including its sustainability over time) is the mediating factor or avenue, through which classroom instruction influences student outcomes."
Taylor, Pearson, et al, p. 158	"As has been found in the research on effective teachers, the most accomplished teachers in this study managed, on average, to engage virtually all of their students in the work of the classroom."
Levin & Long, 1981, p. 5	"In this study, direct interaction with the learning materials and the teacher produced higher levels of achievement than merely listening to or watching the interaction."
Levin & Long, 1981, p. 6	"All the studies share one underlying principle. If instructional processes and procedures elicit student behavior relevant to the learning task, student involvement is likely to increase."
Walberg & Paik, p. 11	"The amount learned reflects both study time and curricular focus."
Shellard, 2001, p. 7	". . . instruction for struggling readers should also include more time for reading and writing than that scheduled for students who are not having problems."
Snow, Burns, & Griffin, 1998, p. 129	"Classroom practices in ineffective schools (regardless of community SES) were characterized by significantly lower rates of student time on task, less teacher presentation of new material, lower rates of teacher communication of high academic expectations, fewer instances of positive reinforcement, more classroom interruptions, more discipline problems, and a classroom ambiance generally rated as less friendly."

Chunking or Clustering

Chunking or clustering bits of information into some meaningful pattern is a useful procedure to allow a person to hold more information in short-term memory than is ordinarily possible. The eight lesson words in each set of ELS lessons are all words with similar spelling patterns, and, for the most part, similar sound patterns—so they are chunked or clustered, rather than taught in an isolated fashion, to facilitate learning and remembering. Chunking is one of the things that make the word families approach to phonics instruction used by ELS so powerful. There is a significant body of cognitive psychology research verifying the efficacy of this strategy. A sampling of findings is provided in the following table.

Table 34: Research Findings on Chunking or Clustering

Researcher(s)	Findings/Conclusions
National Research Council, 1999, p. 84	"Perhaps the most pervasive strategy used to improve memory performance is clustering: organizing disparate pieces of information into meaningful units. Clustering is a strategy that depends on organizing knowledge."
National Research Council, 1999, pp. 84-85	"Known as the chunking effect, this memory strategy improves the performance of children, as well as adults."
McGuinness, 1997, p. 251	"The human brain is particularly adept at storing recurring patterns, and very inefficient at remembering randomness."
Marzano, Pickering, & Pollock, 2001, p. 15	"Presenting students with explicit guidance in identifying similarities and differences enhances students' understanding of and ability to use knowledge. Probably the most straightforward way to help students identify similarities and differences between topics is to simply present these similarities and differences to them. In fact, a great deal of research attests to the effectiveness of this rather direct approach."
Wolfe, 2001, p. 99	"Working memory is indeed limited. Still, before we become too discouraged with its space limitations, we need to realize that these limitations can be circumvented somewhat by the ability to 'chunk' information. In discussing the number of items that one can hold in immediate memory, Miller noted that the items did not have to be single bits but could be chunks of information. A chunk is defined as any meaningful unit of information."
Bruer, 1993, p. 63	"Clustering helps us remember things by exploiting the schema structure of long-term memory; we remember the words by associating them with the appropriate schema."
McGilly, 1995, p. 5	". . . knowledge can be organized in large, interconnected bodies, where pieces of knowledge are conceptually linked to other pieces. . . . The critical difference is not the amount of information, but how the information is organized."
Sharron & Coulter, 1994, p. 140	". . . comparison is one of the basic building blocks of cognition and of abstract systematic thought."
Sprenger, 1999, p. 65	"Remember that semantic memory operates word by word, and it uses working memory. Therefore, each learning experience should be organized to present a short chunk of information. The brain must process the information in some way after the presentation of each short chunk. This processing may take many forms."
McCandliss, Beck, et al, 2003, p. 104	"The intervention directed attention to each grapheme position within a word through a procedure of progressive minimal pairing of words that differed by one grapheme. Relative to children randomly assigned to a control group, children assigned to the intervention condition demonstrated significantly greater improvements in decoding attempts at all grapheme positions and also demonstrated significantly greater improvements in standardized measures of decoding, reading comprehension, and phonological awareness."

Researcher(s)	Findings/Conclusions
Chard, Simmons, & Kameenui, p. 9	"Poor and young readers who are not yet facile at processing letters and sounding out words fail to recode words in meaningful groups and, therefore, are less likely to maintain the meaning of a clause or sentence in short-term memory."
SEDL, a, p. 7	"Children generalize from words they know to words they don't know that are in the same word family. If they learn that the SM in SMILE sounds like /sm/, they generalize that knowledge to other words that contain the letters SM."
Chard & Osborn, 1999, p. 3	"[Children with learning disabilities] benefit from word recognition instruction that offers practice with . . . word families that share similar letter patterns."
Caine & Caine, 1991, p. 7	"The brain is designed as a pattern detector."
Lehr, Osborn & Hiebert, p. 9	"Beyond providing exposure to a range of new and unfamiliar words, reading widely contributes to vocabulary growth by offering students opportunities to make connections among familiar words and unfamiliar but semantically related words—word families."
Gagne', R.,1985, pp. 159-160	"Other studies have shown that nouns presented in organized categories are learned and stored much more rapidly than lists composed of equally familiar nouns not organized into categories."
Adams, 1990, p. 132	"Word families, or phonograms, are lists of words that by design share some significant fragment of their spelling and sound pattern, such as *bill, fill, pill, will, hill.* Within the present context exercise with word families fulfills the desirable goal of reinforcing the integrity of frequent spelling patterns even as they participate in different words. For both skillful readers and computer simulations of skillful readers, the orthographic representations of words with such overlapping spelling patterns are tightly interrelated in memory."

Repetition and Practice

Another major strength of ELS is the scope and variety of its practice activities, again using multi-sensory processing, to provide every available opportunity for students to learn deeply the content and skills presented in each set of lessons. Practice is included as one of the lesson phases discussed in Chapter III; it is also critical to the lesson models of direct instruction, mastery learning, and one-to-one tutoring discussed in Chapter III. Another example is the emphasis of practice or repetition (exposure) in the section on vocabulary methods in Chapter III. One also readily sees the importance of practice and repetition in the achievement of fluency, one of the five critical components of learning to read.

One sees practice additionally in the research-based components of effective at-risk programs (see Chapter I), effective comprehensive literacy programs (see Chapter III), and in effective intervention programs (see Chapter II). Much of the research on multi-sensory processing (see Chapter II) involves the importance of

adequate and varied practice or repetition in encoding knowledge and skills into long-term memory.

The research literature is rich in this area—and abundant. A sampling of findings is provided in the table below.

Table 35: Research Findings on Repetition and Practice

Researcher(s)	Findings/Conclusions
Sternberg, 2003, p. 183	". . . people tend to remember information longer when they acquire it via distributed practice (i.e. learning in which various sessions are spaced over time) rather than via massed practice (with sessions crammed together all at once). The greater the distribution of learning trials over time, the more the participants remembered over long periods."
Sternberg, 2003, p. 183	". . . the spacing effect may occur because at each learning session, the context for encoding may vary, and the individuals may use alternative strategies and cues for encoding, thereby enriching and elaborating their schemas for the information."
Marzano, Pickering, & Pollock, 2001, p. 67	"Mastering a skill requires a fair amount of focused practice."
Sternberg, 2003, p. 184	"To move information into long-term memory, and individual must engage in elaborative rehearsal, in which the person somehow elaborates the items to be remembered in a way that makes the items either more meaningfully integrated into what the person already knows or more meaningfully connected to one another and therefore more memorable."
National Research Council, 1999, p. 113	"One of the simplest rules is that practice increases learning: in the brain, there is a similar relationship between the amount of experience in a complex environment and the amount of structural change."
Gagne', R., 1985, p. 255	"Increasing amounts of practice constitute a fairly dependable factor for affecting amount of retention."
Marzano, 1992, p. 48	"Elaboration involves making many and varied linkages between new information and old."
Marzano, 1992, p. 49	"Virtually all memorization techniques use some form of elaboration. One of the most powerful ways to elaborate on information is to imagine mental pictures, physical sensations, and emotions associated with the information."
National Research Council, 1999, p. 110	"Detailed knowledge of the brain processes that underlie language has emerged in recent years. For example, there appear to be separate brain areas that specialize in subtasks such as hearing words (spoken language of others), seeing words (reading), speaking words (speech), and generating words (thinking with language). Whether these patterns of brain organization for oral, written, and listening skills require separate exercises to promote the component skills of language and literacy remains to be determined. If these closely related skills have somewhat independent brain representation, then coordinated practice of skills may be a better way to encourage learners to move seamlessly among speaking, writing, and listening."

Researcher(s)	Findings/Conclusions
Marzano, 1992, p. 48	"Cognitive psychologists have taught us a lot about storing information in long-term memory. In fact, we know more about how information can be stored for easy retrieval than we do about almost any other aspect of learning. Unfortunately, what we know is usually not taught in the classroom. Most students use only verbal rehearsal, perhaps the weakest of all the strategies available, to help them remember what they have learned. Verbal rehearsal involves saying, reading, or writing information several times. Although verbal rehearsal works, its effectiveness is surpassed by other strategies, all of which fall under the general category of elaboration."
Marzano, 1992, p. 60	"Guided practice is a powerful instructional technique for helping students understand procedural knowledge at a conceptual level. . . . Vygotsky hypothesized that a learner needs the most guidance when working in the zone of development in which she has not yet acquired a skill but has some initial idea of it—in effect, when the learner is shaping a procedure she has been introduced to. What is now called scaffolded instruction is, at its core, guiding a learner through the shaping of a skill or process."
Marzano, Pickering, & Pollock, 2001, p. 69	"While practicing, students should adapt and shape what they have learned."
McGuinness, 1997, p. 168	"Competency stems from practice (repetition). Children willingly practice or repeat actions to obtain mastery. Just because repetition may look boring to an adult doesn't mean it's boring to a child."
Levine & Swartz, p. 7	"A wide range of techniques can be applied to enhance deficient subskills. These include exercise to automate (render fast and effortless) slow and labored writing. Vigorous practice with letter formation or the recall of spelling are examples."
Wolfe, 2001, p. 101	"There are many ways to rehearse information or a skill. One type, called rote rehearsal, consists of repeating the information or the action over and over. . . . It is easy to see why rote rehearsal is essential for forming the strong neural connections necessary to get a skill or habit to the automatic level."
Kamil, 2004, p. 31	"The use of repeated reading resulted in gains in reading ability with an effect size of 0.48."
Alliance for Excellent Education, 2004, p. 3	"Repetition is essential for increasing vocabulary."
National Research Council, 1999, p. 113	". . . classes of words, pictures, and other categories of information that involve complex cognitive processing on a repeated basis activate the brain. Activation sets into motion the events that are encoded as part of long-term memory."
Sharron & Coulter, 1994, pp. 101-102	"To consolidate new thought processes into the general intellectual repertoire of a child, so that their use becomes an intrinsic need, requires a degree of over-learning which can be tiresome and which can encourage an undesirable attitude to work. The instruments have therefore been construed to try to consolidate habits through varied repetition. Particular functions and skills are represented in different ways, altering the content or using different modalities."

Researcher(s)	Findings/Conclusions
Sprenger, 1999, p. 74	"There are two ways to help students access their procedural memory lane. One is to have students perform the material often enough that it becomes a procedure. When a procedure is repeated frequently, the brain stores it in the cerebellum for easy access."
Sprenger, 1999, p. 75	"The automatic memory lane stores multiplication tables, the alphabet, the ability to decode words, and dozens of other memories triggered by simple associations. . . . Other automatic strategies include the use of flash cards, repetition through daily oral work (in math, geography, language, vocabulary, and so on) and oral conditioning. Each of these strategies has its own benefits. Students will tire of the same strategy, so provide variety."
Sprenger, 1999, p. 77	"Repetition is a plus; try to find a way to use it."
Levin & Long, 1981, p. 34	"Most of these studies seem to indicate that learning is more effective if students can practice in a variety of situations. When students are required to cope with frequent changes in the practice exercises, they learn to identify the essential elements in each learning task. They also learn how to adapt to changing circumstances and how to identify common patterns in learning situations. These behaviors are believed to be evoked by varied practices and to facilitate student learning and performance."
Lehr, Osborn, & Hiebert, p. 4	"Developing understandings of word meanings is a long-term process, one that involves many encounters with both spoken and written words in varying contexts. Here's how one group of researchers describes this process. On the first encounter with a new word, a student stores in memory some information about how the word fits into what he is reading. This information is reinforced each time he sees or hears the word. With each new encounter, the student picks up more information about the word from its use in various contexts. As a result, the student gradually acquires 'ownership' of the word."
Gagne', R., 1985, p. 173	"Sheer repetition of labels or facts, in a kind of 'over rehearsal' does not necessarily lead to better encoding or retention. However, when retrieval is practiced, substantial improvement occurs in the later recall of learning information."
Gagne', R.,1985, p. 173	"The practice of verbal information items, when it involves retrieval on the part of learners, constitutes a review of the information being learned and stored. Such review can provide the occasion for additional and more elaborate encoding. It can also increase the variety of retrieval cues learners have at their disposal."
Gagne', R., 1985, p. 278	"Variety in the cueing function can also be provided by requiring the learner to reinstate the learned capability at various times following initial learning. This is done in the technique of spaced review. Even a 'next day' recall and review of a learned rule or concept, for example, may greatly enhance its retention over longer periods."

Researcher(s)	Findings/Conclusions
Torgesen, 2004, p. 377	"The most successful fluency intervention. . . provides the kind of repeated exposure to words that either leads to acquisition of new sight words or increases efficiency of access to words that are already in a child's sight vocabulary."
Shaywitz & Shaywitz, 2004, p. 428	"With time, effective instruction and the experience of repeatedly reading the same word correctly, the child forms the synaptic connections that result in increasingly accurate neural representations of that word. Eventually, an exact neural replica reflecting the word's pronunciation, its spelling, and its meaning, is formed."
Shaywitz, 2003, p. 268	"Approaches that emphasize repeated oral reading with teacher feedback and guidance provides the strongest outcomes. Here I want to tell you about additional activities that might be especially helpful to the reader who is dyslexic. In general these depend on the principle of overlearning, which is just another way of saying that something becomes so ingrained and so automatic that it requires no active attention or conscious thought. Overlearning may be necessary for the development of automaticity in any area. It is the result of extensive repetition, drill, and practice."
Shaywitz, 2003, p. 269	"Practice must be consistent and extend over a period of weeks and preferably months. Since fluency is built on accuracy, students must practice on materials that they can already decode. Practice means rereading the same passage at least four times."
Shaywitz, 2003, p. 270	"It is not surprising to learn that slow or poor readers appear to gain even more from repeated reading practice than do their more able reading peers."
Adams, 1990, p. 133	". . . repeated readings of difficult words and passages result in marked improvement in children's speed, accuracy, and expression during oral reading and, most important, in their comprehension."
Adams, 1990, p. 147	". . . the number of times that children encounter a word is a strong predictor of how well they will learn it."
National Study Group, 2004, p. 11	"Practice is the best strategy for developing improved comprehension. With practice, comprehending complex processes becomes less effortful and more automatic. Practice can be formal or not."
International Dyslexia Association, 2002, p. 2	"Provide additional practice activities. Some materials do not provide enough practice activities for students with learning problems to acquire mastery on selected skills. Teachers must then supplement the material with practice activities. Recommended practice exercises include instructional games, peer teaching activities, self-correcting materials, computer software programs, and additional worksheets."
National Study Group, 2004, p. 16	"Research tells us that a powerful way to promote long-term retention and transfer is to allow students to practice retrieving previously taught material from long-term memory."

Researcher(s)	Findings/Conclusions
Herrell, 2000, p. 184	"Repetition and innovation strategies provide students with multiple opportunities to learn new concepts. The choice of repetitions and innovations should be based on observation of the students' understanding of the concepts being presented. Each repetition or innovation should build on the last so that the students are experiencing gradually more difficult applications of the concepts. These activities are especially supportive of English-language learners because they see multiple definitions and uses of the new concepts and vocabulary they are using."
Papanicolaou, Pugh, et al., 2004, p. 411	"Indeed, instruction and practice seem essential for developing and strengthening the neural networks that must be in place for the brain to support complex activities such as reading."
Osborn, Lehr, & Hiebert, p. 8	"With fluency so important to reading success, what can be done to help students become fluent readers? The simple answer is to give them practice, practice, practice, and more practice with reading."
Samuels, 2002, p. 174	"Other research evidence also shows that repeated exposures to the same words leads to improvements in fluency."

Chapter III included Table 14 that coded the lesson phase or phases of each of the approximately 30 ELS tasks. A review of that table and Table 27 indicates that 20+ tasks involve practice—in varied ways, using multi-sensory processing, so that automaticity or fluency is achieved and so that learning can be easily retrieved using more than one modality. Practice is important in teaching well all five of the NCLB components—phonics, phonemic awareness, fluency, vocabulary, and comprehension.

Table 35 begins with findings by Sternberg (2003) on the efficacy of spaced or distributed practice, as opposed to mass practice. ELS uses distributed practice over several tasks and throughout its lesson sequences. Using the cumulative scientific research on the topics of practice and repetition, as well as other related topics, it is clear that ELS is based in scientific research in the way that it incorporates practice and repetition into the program.

Frequent, Multiple Assessments

CEI provides a comprehensive assessment system in its ELS program. As stated by International Reading Association (2004), "Children deserve classroom assessments that bridge the gap between what they know and are able to do and relevant curriculum standards. Effective assessments are crucial for students who are falling behind. They deserve assessments that map a path toward their continued literacy growth." The intent of CEI is that they do just that, and that is why there are aspects of assessment within almost all ELS tasks. The teacher uses student performance to make modifications in subsequent activities.

The various types and uses of ELS assessment instruments are delineated below:

1. Dynamic (Formative) Assessments
   A number of the "tasks" designed for the ELS program (such as See Say, Echo, and Quick Talk) are, in actuality, embedded dynamic assessments—assessments that help the teacher/facilitator decide where the student is in learning the lesson's content or skill. Daily computer-generated reports also provide a record of each student's performance on the day's lessons for additional information. Teachers/ facilitators use the data to make determinations about the next appropriate lesson and the parameters that should be set, assigning the student, when necessary, to a lesson recycle. These assessments are formative in nature and are criterion-referenced since they directly relate to what is being taught.

2. Norm-Referenced Assessments
   CEI provides a third-party standardized test to be administered as a pre- and post-test measurement of student growth in basic reading skills and concepts, as well as reading comprehension. The *Diagnostic Screening Test: Reading (DSTR)* by Gnagey and Gnagey (1982) provides teachers with normed scores, as well as information to be used in assessing individual student, subgroup, and class growth for program evaluation purposes. In other words, value-added can be calculated.

3. Criterion-Referenced Assessments
   The *ELS Placement Test* is administered at the beginning of the school year to determine which level and lesson sequence is the appropriate placement for an individual student. The test is criterion-referenced in that it tests the program content so that each student's zone of proximal development can be determined for the right level of challenging instruction.

   Mastery lessons are also built into the ELS program so that the teacher can determine whether the student achieved a high level of mastery. If not, the student will be assigned to a lesson recycle until 100 percent mastery is achieved.

4. Diagnostic Assessments
   The *Learning Efficiency Test II (LET-II)*, developed by Dr. Raymond Webster (1998), is a third-party diagnostic assessment that provides information to the teacher/facilitator on the student's learning strengths and weaknesses and on learning preferences. Information is also provided on immediate, short-term, and long-term recall. Use of this

information allows the teacher better to determine each individual student's learning needs and provides guidance in setting lesson parameters for maximal effectiveness.

The *DSTR* is also a diagnostic instruction in that it identifies content/ skill strengths and weaknesses. The *ELS Placement Test* assesses student knowledge for data to use in program placement.

5. Teacher/Facilitator Observations
   The ongoing engagement of the teacher/facilitator in monitoring student performance and progress is a signature component of the ELS program design. The teacher/facilitator combines her/his informal observations, as well as observations during student recitation, with the objective data provided in progress reports to determine next steps for instruction for each individual student.

6. Assessment Alignment
   CEI provides correlations to each state's curriculum standards and language arts assessment standards. Additionally, CEI has published a correlation of ELS content/skills with the knowledge and skills assessed in the various state's tests to measure growth in English language proficiency among second language learners. Correlations with DIBELS and the Texas Primary Reading Inventory are also available for Reading First schools.

Relevant research on the importance of various kinds of assessments are cited in the table below:

Table 36: Research Findings on Assessment

Researcher(s)	Findings/Conclusions
Levine, 2002, p. 310	"The great baseball catcher Yogi Berra has been quoted as saying, "You can observe a lot by watching." Teachers have nearly exclusive access to what I call the observable phenomena, the windows that offer an unobstructed view into a child's learning mind."
Levine, 2002, p. 310	"Observable phenomena provide insights that are unavailable on the standardized achievement or diagnostic tests commonly used in schools and clinics. A sizable number of the dysfunctions described in this book are not detectable on any test. But we know they are there because we can see them."
Dixon-Krauss, 1996, p. 126	"The most important feature of dynamic assessment is that the type of information it provides can be used by teachers to address problems, issues, and concerns in classroom instruction."

Researcher(s)	Findings/Conclusions
Dixon-Krauss, 1996, p. 126	"Literacy assessment is moving from a static individual approach to a dynamic social approach. The key feature of the dynamic approach is that it links assessment with instruction because it occurs during instruction rather than after the fact. Dynamic assessment provides the teacher with different types of information than static assessment, and it requires different methods for obtaining and analyzing this information."
Dixon-Krauss, 1996, p. 129	". . . dynamic assessment provides information on the amount and type of help students need to perform the tasks. This type of information enables the teacher to design and adjust classroom literacy so that her students from diverse backgrounds are included in, rather than isolated from, challenging tasks that tap their potential."
Dixon-Krauss, 1996, p. 138	"An underlying premise of this movement of empowerment is that not only should diagnosis be a blueprint for instruction based on looking for strengths, it should also involve a shift toward looking for the cause of the problem in the social and educational context, not within the student. In other words, examiners are not just asking what is wrong with the child, but also what is wrong with the child's instruction."
Dixon-Krauss, 1996, p. 126	"Vygotsky believed that educational assessment should . . . include measuring students' potential development or what they are in the process of learning. He described the zone of proximal development as encompassing the discrepancy between a students' actual level of development and the higher level she can reach when her performance is supported by assistance during collaboration with an adult or capable peers."
Davidson, 1994, p. 19	". . . the best instructional improvements are informed by ongoing assessment of student strengths and needs. Such assessments are often, but not exclusively, informal and frequently occur on a daily basis, and therefore are not necessarily suited to the summative task of accountability reporting systems. Data should be cataloged on a computer system that would allow teachers, administrators, and evaluators to inspect students' progress individually and by class. These formative assessments are specifically designed to inform instruction on a very frequent basis so that adjustments to instruction can be made to ensure that students are on pace to reach mastery targets."
ERS, 2002, p. 79	"Ongoing assessment, a key component of effective reading intervention programs, provides important information about student abilities and the effectiveness of strategies and methods."
Snow, Burns, & Griffin, 1998, p. 323	"Because the ability to obtain meaning from print depends so strongly on the development of word recognition accuracy and reading fluency, both of the latter should be regularly assessed in the classroom, permitting timely and effective instructional response where difficulty or delay is apparent."
Alliance for Curriculum Reform, 1995, p. 83	"Assessment that focuses on what is being taught in a school's curriculum and on the modes of instruction used in the curriculum promotes learners' growth toward curricular goals."
Neuman & Roskos, 1998, p. 13	"Assessment of early literacy should be continuous, examined in multiple contexts, and focused on a variety of behaviors."

Researcher(s)	Findings/Conclusions
Levine & Swartz, p. 6	"Multiple forms and sources of assessment information should be gathered. Evidence should derive from direct observations by teachers and parents, interviews with the child, careful analyses of work samples, as well as formal testing procedures."
IRA, 2001, p. 7	"Children deserve classroom assessments that are regular extensions of instruction, provide useful feedback based on clear, attainable, worthwhile standards, exemplify quality performances illustrating the standards, and position students as partners with teachers in evaluating their progress and setting goals."
Alliance for Excellent Education, 2004, p. 4	"In order to address the important function of assessment, programs should • make assessment a regular extension of instruction; • link instruction to the results of testing (using assessment outcomes to determine effective practice); • monitor student performance on a regular basis so teachers are aware of student progress; • provide useable feedback based on clear, attainable, and worthwhile standards, and • include components to diagnose students' initial ability and also to assess how students are progressing."
Bonstingl, 1992, p. 19	"Assessment for diagnostic and prescriptive purposes should inform every point along the line in the educational production process, providing teachers and students with a solid foundation for continuous improvement toward optimal success, rather than a judgmental 'mark' or other end-of-the-line symbols of learning."
Bonstingl, 1992, p. 78	"Tests and other indicators of student learning should be given as diagnostic and prescriptive instruments throughout the learning process."

Corrective Feedback. Feedback to students on their progress is an important feature of ELS instruction. Students receive auditory feedback from the computer as they work through lessons. Further, this feedback is differentiated on each item when they struggle. They receive teacher feedback as a part of various practice and assessment activities. They receive teacher feedback as a part of the teacher's observations of their progress. They provide their own feedback through various self-assessment exercises. Daily progress printouts provide written and verbal feedback for the student. Periodic reports are also available to both students and their parents. Results of the more formal assessments are also provided as feedback, along with interpretations. A feature of ELS 7.0 is the inclusion of parent reports in Spanish, as well as English.

The table below cites relevant research on the power of feedback, especially in developing higher levels of literacy:

Table 37: Research Findings on Corrective Feedback

Researcher(s)	Findings/Conclusions
Davidson, 1994, p. 185	"The study measured both the intelligibility and the effectiveness of a computer system that gives spoken feedback during reading sessions. Pretests and posttests were administered. . . . The results indicate that children found the computer generated speech as intelligible as that of the classroom teacher. The results also show that the children who received treatment demonstrated improvements in reading."
Cotton, 2000, p. 24	"Some investigations have found instructional reinforcement to have the most powerful positive effect on student achievement of all indicators of instructional quality. And research in general supports the practice of letting students know how they are doing and corroborating their accurate responses—in classroom recitations, on homework assignments, as part of instructional software programs, and so forth."
Davidson, Elcock, & Noyes, 1996, p. 110	"This study evaluated the effectiveness of computer-assisted practice on the reading achievement of 60 elementary students. . . . Over 4 weeks, teachers continued regular classroom instruction for all students; the 30 students receiving treatment also had daily individual computer sessions using headphones. The results suggest that computer-assisted practice may have a positive effect on improving reading performance."
Levin & Long, 1981, p. 18	"At the end of the eight learning units, students in both groups took a final achievement test and a retention test. Wentling's results, when measured on the final achievement test and the retention test, indicated significant advantages in favor of students who were provided with feedback and corrective procedures in relation to a standard."
Levin & Long, 1981, p. 18	"This study demonstrates that students in the feedback and corrective group learned more than the students who were deprived of feedback and correction."
Levin & Long, 1981, p. 19	"According to Bloom, under more ideal conditions of feedback and correctives, as many as 90 percent of the students can achieve the same performance level reached by the top 20 percent of the students who are deprived of feedback and corrective opportunities."
Levin & Long, 1981, p. 19	"Feedback and corrective procedures related to an appropriate standard help most students, regardless of intelligence or aptitude, to attain the desired educational goal."
Marzano, Pickering, & Pollock, 2001, p. 97	"Feedback should be timely."
Marzano, Pickering, & Pollock, 2001, p. 96	"Feedback should be 'corrective' in nature."
Marzano, Pickering, & Pollock, 2001, p. 98	"Feedback should be specific to a criterion."

Researcher(s)	Findings/Conclusions
Literacy Explorer, p. 1	"A study . . . demonstrated that a bimodal reading program delivered via computer that poor readers 'not only feel more successful… but are more successful in terms of comprehending content.' This correlates with additional studies on speech synthesis technologies. . . for reading instruction where results indicated that speech feedback significantly benefited both word recognition and reading comprehension."
Gagne', R., 1985, p. 254	"Following the performance which shows that learning has occurred, there must be a communication to the learner about the correctness and the degree of correctness of the performance. This event may be carried out a number of different ways. . . . Some valuable kinds of feedback can be provided in computer-aided instruction."
USDE, 1986, p. 43	"Frequent and systematic monitoring of students' progress helps students, parents, teachers, administrators, and policymakers identify strengths and weaknesses in learning and instruction."

Informed Instruction (Data-Driven Decision-making). ELS teachers/ facilitators are trained to make use of all available assessment data to make initial placement decisions of students into the program and then to adjust and adapt instruction based on the data from observations, ongoing assessments, performance on mastery lessons, and the periodic reports that are generated. This process results in what is termed "informed instruction" or "data-driven decision-making" as it pertains to instruction.

Samway and McKeon (1999) outlined the following uses of assessment:

- Determine what students can do;
- Establish students' learning strategies, skills, and processes;
- Make instructional decisions; and
- Decide how to flexibly group students for instruction (p. 62).

A "learner-centered assessment program," according to Samway and McKeon (1999), has the following features:

- Is ongoing and continuous
- Determines what students can do linguistically and academically
- Identifies students' learning strategies, skills, and processes
- Facilitates sound instructional decision making
- Assists in grouping students for instruction
- Addresses all language modalities (listening, speaking, reading, and writing)
- Incorporates student self-assessment
- Invites parent assessment of students (p. 62).

In an ELS lab, the teacher sets lesson parameters and perhaps adjusts the level of instruction for individualized/differentiated instruction instead of using data for grouping students. One-to-one tutoring is the optimal grouping (see Chapter III).

The research relating to the assessment process and use of data to inform instruction is compelling and is cited in the table below:

Table 38: Research Findings on Informed Instruction

Researcher(s)	Findings/Conclusions
Walberg & Palk, p. 17	"More than fifty studies show that careful sequencing, monitoring and control of the learning process raise the learning rate. Pre-testing helps determine what should be studied; this allows the teacher to avoid assigning material that has already been mastered or for which the student does not yet have the prerequisite skills. Ensuring that students achieve mastery of initial steps in the sequence helps ensure that they will make satisfactory progress in subsequent, more advanced steps. Frequent assessment of progress informs teachers and students when additional time and corrective remedies are needed."
IRA, 2001, p. 7	"Assessments must provide information for instructional decision making as well as for public accountability."
Levin-Epstein, 2004, p. 1	"Today's software solutions have the capability to provide curriculum tailored to every student's strengths and weaknesses, allow teachers to monitor student performance in real time, administer assessments and adjust instruction in line with the results, interface with gradebooks, send reports to parents—and more."
Learning First Alliance, 1998, p. 14	"In first grade and beyond, regular curriculum-based assessments are needed to guide decisions about such things as grouping, the pace of instruction, and individual needs for assistance (such as tutoring)."
McGuinness, 1997, p. 293	" . . . a reading specialist who does not use diagnostic testing is not doing her job properly."
Safer & Fleischman, 2005, p. 81	"Research has demonstrated that when teachers use student progress monitoring, students learn more, teacher decision making improves, and students become more aware of their own performance. A significant body of research conducted over the past 30 years has shown this method to be a reliable and valid predictor of subsequent performance on a variety of outcome measures, and thus useful for a wide range of instructional decisions."
Safer & Fleischman, 2005, p. 81	"Although student progress monitoring . . . was initially developed to assess the growth in basic skills of special education students, specific research has validated the predictive use of this method in early literacy programs and in the identification of general education students at risk for academic failure."
Safer & Fleischman, 2005, p. 83	". . . many teachers find this strategy worth the effort because it provides a powerful tool that can help them adjust instruction to ensure that all students reach high standards."

Researcher(s)	Findings/Conclusions
Crawford, Bodine, & Hoglund, 1993, p. 3	"In fact, the inspection of student achievement through mass testing actually prevents quality learning because teachers spend a significant portion of their instructional time teaching for the purpose of raising test scores."

Self-Assessment

"Try to teach students this important lesson: The success or failure of our lives is greatly dependent on our willingness to judge the quality of what we do and then to improve it if we find it wanting." –Glasser, 1990, p. 159

William Glasser (1990) stated that one of the two critical practices in a quality school is self-assessment, by staff and by students (p. 156). ELS overtly incorporates self-assessment in its Auditory Feedback and Copy-Write-Editing tasks, and it encourages self-assessment in all performances. Numerous other researchers have also investigated the power of that process.

Table 39: Research Findings on Self-Assessment

Researcher(s)	Findings/Conclusions
National Research Council, 1999, p. 128	"Effective teachers also help students build skills of self-assessment. Such self-assessment is an important part of the metacognitive approach to instruction."
Alliance for Curriculum Reform, 1995, p. 14	"In the 1980's, cognitive research on teaching sought ways to encourage self-monitoring, self-teaching, or 'meta-cognition' to foster achievement and independence. Skills are important, but the learner's monitoring and management of his or her own learning has primacy. This approach transfers part of the direct teaching functions of planning, allocating time, and review to learners. Being aware of what goes on in one's mind during learning is a critical first step to effective independent learning."
Marzano, Pickering, & Pollock, 2001, p. 99	"Students can effectively provide some of their own feedback."
Sousa, 2001b, p. 129	"Have students proofread after a delay when they are more likely to catch writing errors. This way, they will see what they actually wrote rather than what they thought they wrote."
Cameron, Edmunds, et al, 1997, p. 680	"These data confirm that children respond positively to writing challenges in the area of revision, a skill in process of development, which is amendable to inspection and appears ripe for facilitation."
Glasser, 1990, p. 156	". . . the two most powerful practices of a quality school are the elimination of coercion and student self-evaluation."
Crawford, Bodine, & Hoglund, 1993, p. 3	"According to Deming, inspection of a finished product as it comes off the line or at key points during production are too late, ineffective, and unnecessarily expensive. . . . Inspection the Deming way, then, is a process in which the workers are enlisted and trained to evaluate the quality of their own work."
Bonstingl, 1992, p. 78	"Students must be taught how to assess their own work and progress if they are to take ownership of their own educational processes."

Summary

Chapter IV discussed the scientific research behind the most powerful of the instructional strategies used in ELS: computer-assisted instruction; individualized and differentiated instruction; active engagement and time-on-task; chunking or clustering; repetition or practice; and the use of frequent, multiple assessments with feedback, informed instruction, and self-assessment.

There were abundant and unequivocally positive findings for each of these strategies, including the ways in which they are incorporated into ELS. Of particular interest, because it is, for the most part, newer research, may have been the section on computer screen design. The research findings indicate the soundness in CEI's approach of emphasizing simplicity and consistency in the design of its program screens so that learners with learning difficulties or disabilities are not distracted from the purpose of the lesson.

It is important, again, to emphasize the interrelatedness of all the parts of the ELS program. Each task includes portions of a lesson phase, a lesson model, specific content and/or skills, the use of specific instructional strategies, supported by other program features—and all utilizing the powerful cognitive strategy of multi-sensory processing, as well as the influence of an engaged teacher/facilitator. It was difficult at times to decide where to include a specific research finding relating, for instance, to a vocabulary study. It might be useful under the topic of vocabulary, under vocabulary methods, as a way to improve fluency, as a step toward comprehension, as an example of multi-sensory processing, as an example of student engagement, as evidence on the importance of repetition and practice, as an example of the effectiveness of computer-assisted instruction, as an example of individualization, and on and on. Again, the ELS components never operate discretely, but in intricately intertwined ways.

Chapter V: Additional ELS Program Features

ELS also includes a number of other scientifically-based features, which are provided by CEI to strengthen the effectiveness of implementation so that maximal student growth can be achieved:

- Motivation and Recognition
- Parental Involvement
- Professional Development and Follow-Up Coaching
- Implementation

Motivation and Recognition

> ". . . it is clear that reading failure has a devastating effect on children."
> —Lyon, Apr. 1998, p. 10

One of the startling findings in Hart and Risley's 1995 study related to the lack of positive feedback that many, many preschoolers from poverty households receive in their daily lives, as compared to the lives of children from professional families. Understanding these numbers makes it abundantly clear why schools must be very concerned about motivation of students.

> In a 5,200 hour year, the amount would be 166,000 encouragements to 26,000 discouragements in a professional family, 62,000 encouragements to 26,000 discouragements in a working-class family, and 26,000 encouragements to 57,000 discouragements in a welfare family. Extrapolated to the first 4 years of life, the average child in a professional family would have accumulated 560,000 more instances of encouraging feedback than discouraging feedback, and an average child in a working class family would have accumulated 100,000 more encouragements than discouragements (p. 199).

This same study found incredibly large gaps between the vocabularies of the children of professional parents and the children living in housing projects. Vast numbers of children, then, enter school each year severely disadvantaged in language acquisition and in familiarity with print and vocabulary—and with more than twice as many of their interactions with their parents being negative rather than positive. Those are major reasons that they come to school at risk of failure.

The daunting challenge of the school is not only to close as much of the achievement gap as possible, but also to motivate the student to believe in his or her own efficacy, to believe that effort makes a difference, to want to learn, especially to learn how to read.

CEI is a part of a family of companies owned by Mr. Paul Meyer, who has devoted much of his career to teaching others about success motivation, so CEI

staff are very cognizant of the important role of motivation in successfully teaching students to read and include in the teacher/facilitator training many suggestions that go beyond the motivational strategies built into computer-delivered instruction.

Chapter IV included research on the motivational benefits of working in the "zone of proximal development," with work that is adequately challenging, but enabling (with mediation) high levels of success, and the power of immediate corrective feedback. Tasks that are too easy have a negative effect on motivation, but Mercer and Mercer (2005) pointed out that "one of the primary findings in research" is that "learning improves most when students have a high percentage of correct responses" (p. 34). Additionally, the support program includes various recognition activities, such as certificates for mastery and completion, articles about outstanding students in SHARE (CEI's newsletter), and recognition for participation and achievement in the Creative Writing Contest.

In Meyer's (2002) *Unlocking Your Legacy: 25 Keys to Success,* he includes a chapter on self-image, where he identifies these six barriers to a positive self-image:

1. Staying in the comfort zone and living at the present level of success is easier and less stressful than exerting effort to make needed changes.
2. Fear of making a mistake or risking possible failure discourages trying anything new or different.
3. The desire to avoid disapproval, either by themselves or by others, limits many to behavior that is calculated to please.
4. Anxiety about changing the status quo convinces some that change is negative and not worth the risk.
5. A poverty mentality, coupled with a false sense of inferiority, causes some people to believe they do not deserve the rewards of using their full potential.
6. An illogical fear of success prevents many from breaking the success barrier. They feel unworthy or they fear they will not know how to handle success, so they subconsciously avoid it (pp. 90-91).

Students who fail academically every day, in public, no doubt suffer from negative self-image. Overcoming the barriers to a positive self-image outlined by Meyer is a part of the steps that they have to take in order to be motivated to learn to read and to be successful in school.

Meyer also feels strongly that success comes from desire coupled with effort, and that connection seems to be authenticated in the following cited studies.

> Purposely choosing to strengthen your self-image is an amazing possibility and the rewards and benefits will last for a lifetime, so keep pressing in and pressing on—then you can press through anything! Along

> the way, don't be discouraged if it takes effort and time. Nothing worth getting in life is ever free, but the payoff at the end will be worth every ounce of effort (p. 91).

Csikszentmihalyi (1991), one of the foremost authorities on motivation, says we all want more of what he calls "flow," or "the optimal experience" that is the result of a series of conditions:

> When people reflect on how it feels when their experience is most positive, they mention at least one, and often all of the following: First, the experience usually occurs when we confront tasks we have a chance of completing. Second, we must be able to concentrate on what we are doing. Third and fourth, the concentration is usually possible because the task undertaken has clear goals and provides immediate feedback. Fifth, one acts with a deep but effortless involvement that removes from awareness the worries and frustrations of everyday life. Sixth, enjoyable experiences allow people to exercise a sense of control over their actions. Seventh, concern for the self disappears, yet paradoxically the sense of self emerges stronger after the flow experience is over. Finally, the sense of the duration of time is altered; hours pass by in minutes, and minutes can stretch out to seem like hours. The combination of all these elements causes a sense of deep enjoyment that is so rewarding people feel that expending a great deal of energy is worthwhile simply to be able to feel it (p. 49).

CEI, of course, wants a learner's experience in an ELS lab to be a "flow" experience.

One of the stories, to illustrate this point, that is frequently told by Mr. Ben Rodriguez, a senior vice president of CEI, is that he was visiting an ELS lab early in the school year one fall and was particularly watching one small boy, who was very engaged in his work at the computer. One feature of the computer-assisted instruction is the feedback provided after each student response, which is either praise for correct responses or encouragement to try again when the response has been in error. This small boy responded correctly, and the computer voice said, "Good job!" The boy looked around briefly, and then with a smile on his face, patted the computer monitor on its side and whispered, "Thanks!"

This small boy was perhaps having the first "flow" experience of his life—if he came from that welfare home described by Hart and Risley and no doubt experienced some of the barriers articulated by Meyer.

The story illustrates several of the ways in which ELS incorporates motivation to learn to read in the delivery of its instruction:

- Students are placed into the program at a level that assures a high degree of success, yet with sufficient challenge to maintain interest.

- Students receive auditory praise when they respond correctly and encouragement when they do not, so that they will be willing to try again.

- Students receive written feedback daily in their progress report, which gives them a feeling of accomplishment and a sense that their efforts are paying off.

- Teachers/facilitators are encouraged in their training and in the *Teacher's Manual* to provide positive and encouraging feedback to students as they monitor their performance.

- Practice exercises are varied to maintain interest, even though the lesson goal stays constant.

- CEI provides numerous opportunities for student recognition:
  - Articles in SHARE about outstanding students
  - Achievement certificates signed by the president of the company
  - Recognition for participation in and awards for winning the Creative Writing Contest

In reviewing the scientific studies on motivation, one sees reoccurring themes—many of which echo Meyer's emphasis on the importance of effort and many of which reflect the definition of "flow," as defined by Csikszentmihalyi.

Table 40: Research Findings on Motivation

Researcher(s)	Findings/Conclusions
McGuinness, 1997, p. 285	"What children want most is to show that they are competent in all areas in which their age mates are competent."
Marzano, 1992, p. 25	"Current research and theory on motivation. . . indicate that learners are most motivated when they believe the tasks they're involved in are relevant to their personal goals."
Marzano, 1992, p. 27	"Learners who believe they have the inner resources to successfully complete a task attribute their success to effort; there is no task they consider absolutely beyond their reach."
Crawford, Bodine, & Hoglund, 1993, pp. 25-26	". . . the teacher must create an environment where students can feel pride in their learning. Pride, an internal sense of one's own dignity and self-worth, is indispensable to quality learning."
Crawford, Bodine, & Hoglund, 1993, p. 26	"Coercion, or managing through fear, is the most destructive element in a workplace."

Researcher(s)	Findings/Conclusions
Crawford, Bodine, & Hoglund, 1993, p. 26	"Fear takes a devastating toll in education. Management by fear, whether it means the principal managing teachers or teachers managing students, prevents people from thinking. It deprives them of pride in their work and thus destroys intrinsic motivation."
Crawford, Bodine, & Hoglund, 1993, pp. 26-27	"Fear in education takes the form of performance appraisals, evaluations, grades, punishments, reprimands, and competitive reward systems. . . . To eliminate fear, principals and teachers must strive to create an environment where intrinsic motivation is understood, is valued, and is the inspiration for learning."
Marzano, Pickering, & Pollock, 2001, p. 50	"Not all students realize the importance of believing in effort. . . . The implication here is that teachers should explain and exemplify the 'effort belief' to students.
Marzano, Pickering, & Pollock, 2001, p. 52	"A powerful way to help [students] make this connection [between effort and achievement] is to ask students to periodically keep track of their effort and its relationship to achievement."
Glasser, 1990, p. 35	"It is only the discovery that 'I can do quality work' that leads to motivation."
Glasser, 1990, p. 40	"Resentful workers will not do anything well that is the least bit complicated."
Glasser, 1999, p. 117	"We spend too much effort trying to force students to read and many learn to hate reading."
Marzano, Pickering, & Pollock, 2001, p. 55	"Rewards do not necessarily have a negative effect on intrinsic motivation."
Marzano, Pickering, & Pollock, 2001, p. 57	"Reward is most effective when it is contingent on the attainment of some standard of performance."
Marzano, Pickering, & Pollock, 2001, p. 57	"Abstract symbolic recognition is more effective than tangible awards."
Marzano, Pickering, & Pollock, 2001, pp. 57-58	". . . it appears obvious that abstract rewards—particularly praise—when given for accomplishing specific performance goals can be a powerful motivator for students."
Marzano, Pickering, & Pollock, 2001, p. 58	". . . it is best to make this recognition as personal to the students as possible."
Bruer, 1993, p. 258	"If we want more students to thrive, we will have to restructure classrooms and schools to create environments where children believe that, if they try, they can learn."
Levin & Long, 1981, p. 8	". . . students in the mastery group develop higher levels of motivation for later units in the series. Since they have experienced success in the earlier units, they are more confident in their ability to learn well and to succeed in subsequent units."
Providing Appropriate Levels of Challenge, 2000.	"The right level of challenge is always a moving target. As skill improves, the next challenge tests new mastery to just the right extent. The same kind of incremental, responsive challenge can foster engagement in the classroom. Without new challenges, students become bored; impossible challenges frustrate and dishearten them. The right level of challenge at the right time can 'pull in' students the way video games do, building mastery a step at a time."
Kujala, Karma, et al, p. 7	"As previous studies have shown, attention and motivation are important factors in causing plastic neural changes in the brain."

Researcher(s)	Findings/Conclusions
Sousa, 2001b, p. 209	"Look for abilities, not just disabilities. Sometimes we get so concerned about the students' problems that we miss the opportunity to capitalize on their strengths. Many studies indicate that using an individual's strengths to mitigate areas of weaknesses often results in improved performance and a well-needed boost to that person's self-esteem."
Smey-Richman, 1988, pp. 24-25	"Success at novel and challenging tasks is important to low achieving students. . ., but overly difficult tasks produce confusion and discouragement. According to Brophy, the degree of cognitive strain produced by tasks that allow students a 50 percent or less success rate is so great that it exceeds the tolerance level of the slow learner. In this regard, Harter has shown that students feel motivated when they experience success with what they perceive as reasonable effort, but are discouraged when they achieve success only with sustained effort."
Smey-Richman, 1988, p. 25	". . . the combination of high effort and failure is especially damaging, as it leads to suspicion of low ability. It is this self-realization of incompetency that triggers humiliation and shame."
Smey-Richman, 1988, p. 25	". . . continued success on easy tasks is ineffective in producing challenge-seeking and persistent behavior. . . consistently easy tasks lower self-confidence."
Shaywitz, 2003, p. 284	"Motivation is critical to learning and can be strengthened by adhering to a few simple principles. First, any child, and particularly one who is dyslexic, needs to know that his teacher cares about him. Second, motivation is increased by a child's having a sense of control, such as a choice about assignments—which book he will read or what topic he will report on. Third, he needs some recognition of how hard he is working as well as tangible evidence that all his effort makes a difference; this can come in the form of improvement on a graph of his fluency rates or receiving a grade on the content of his written work rather than its form."
Levine, p. 3	"So a student can lose motivation because he doesn't like a goal, because he feels he could get that goal, or because the goal would be much too hard to get. You can see how a student with learning disorders might lose motivation when it comes to getting a good report card."
Levine, p. 3	"Most of the time when kids are bored in school, it is either because they are having trouble with their attention or because they don't fully understand what is going on."
Tileston, 2000, p. 5	"Jenson believes that enrichment in the classroom comes primarily from challenge and feedback. He warns that too little challenge in the classroom breeds boredom and that too much can intimidate. Challenge should be filtered so that it provides stimulating and fun experiences that match the ability of the student without causing frustration."
McGuinness, 1997, p. 167	"A reading program should be good enough to make every child competent."

Researcher(s)	Findings/Conclusions
Cox & Guthrie, 2001, p. 131	"Results showed that amount of reading for enjoyment was predicted most highly by motivation, when all other variables were controlled statistically in multiple-regression analyses. In contrast, reading for school was predicted most highly by strategy use, when all other variables were controlled. . . . Findings of this study indicate that amount of reading is multiply determined by cognitive and motivational constructs, which is consistent with an engagement perspective on reading development."

Parental Involvement

CEI staff provide a parent workshop for the parents of ELS students so that parents will know what their children will be doing in the ELS lab and how they can support their growth, as well as the kinds of growth they can expect to see. In addition, student progress reports are available for parents, including a Spanish translation for those who need it. ELS teachers/facilitators are encouraged to involve parents as much as possible because of the abundance of SBR that predicts higher achievement when that occurs.

Table 41: Research Findings on Parental Involvement

Researcher(s)	Findings/Conclusions
Alliance for Curriculum Reform, 1995, p. 9	"Dozens of studies in the U. S., Australia, Canada, England, and elsewhere show that the home environment powerfully influences what children and youth learn within and outside school. This environment is considerably more powerful than the parents' income and education in influencing what children learn in the first six years of life and during the 12 years of primary and secondary education."
National PTA, 2000, pp. 12-13	"The most accurate predictors of student achievement in school are not family income or social status, but the extent to which a student's family is able to (1) create a home environment that encourages learning; (2) communicate high, yet reasonable expectations for the child achievement and future career; and (3) become involved in the child's education at school and in the community."
Gray & Fleischman, Dec. 2004/Jan. 2005, p. 85	"When parents are involved, students tend to achieve more, regardless of socioeconomic status, ethnic/racial background, or the parents' educational level."
Gray & Fleischman, Dec. 2004/Jan. 2005, p. 85	"A final key component of serving the needs of English-language learners is establishing strong relationships with families."
Taylor, Pearson, et al, 2000, p. 158	"At the school level, the most effective schools made more of an effort to reach out to parents than the moderately and least effective schools. At the classroom level, the teachers in the most effective schools made more of an effort to communicate regularly with parents than teachers in the other schools."

Researcher(s)	Findings/Conclusions
National PTA, 2000, p. 12	"If parents do not participate in school events, develop a working relationship with their children's educators, or keep up with what is happening in their children's schools, their children are more likely to fall behind in academic performance."
National PTA, 2000, p. 17	"When parents receive frequent and effective communication from the school or program, their involvement often increases, their overall evaluation of educators often improves, and their attitudes toward the program are often more positive."
Sousa, 2001b, p. 213	"Frequent communication with parents is important so that you are all working together to assist the student in meeting expectations."
Neuman & Roskos, 1998, p. 12	"Communication between families and teachers built on mutual respect and the sharing of information creates bonds of continuity, purpose, and consistency in children's early literacy programs."
Walberg & Paik, p. 7	"Co-operative efforts by parents and educators to modify these alterable academic conditions in the home have strong, beneficial effects on learning. In twenty-nine controlled studies, 91% of the comparisons favoured children in such programmes over non-participant control groups."
ERS, 2000, p. 1	"The research base developed over many years has made it clear that meaningful family involvement is a powerful predictor of high student achievement."
Stein & Thorkildsen, 1999, p. 31	"Results of experimental studies reviewed here show statistically significant differences on measures of achievement between children whose parents participate in parent involvement programs and those who do not."
Stein & Thorkildsen, 1999, p. 32	"Of all aspects of parent involvement studied, parents' expectations of their children's achievement have the strongest relationship with children's actual level of achievement."
Stein & Thorkildsen, 1999, p. 32	"Schools must play a major role in encouraging involvement through regular invitations to school activities and social events."
Stein & Thorkildsen, 1999, p. 33	"All types of parents have been successful in parent involvement activities. Consequently, economic disadvantage should not be viewed as a barrier to getting parents involved."
National PTA, 2000, p. 12	"In programs designed to involve parents in full partnerships, student achievement for disadvantaged children not only improves, but can also reach levels that are standard for middle-class children. Children who are furthest behind are the most likely to make the greatest gains."

Professional Development and Follow-Up Coaching

"A major strength of CEI is," according to Robin Wilson, CEI training manager, "the quality and intensity of its professional development program." CEI provides an initial three-day training session for ELS teachers/facilitators. On-going coaching and follow-up are provided by certified teachers who conduct frequent visits to the lab and who are available at all times via e-mail and telephone for consultation. CEI further provides expert consultation on a variety of educational topics through staff in its corporate office. Professionally written, research-based

teacher manuals are provided to teachers/lab facilitators in the training sessions and then become handbooks for operating the labs throughout the school year. Teachers also have 24/7 access to expertise via CEI's webpage at **www.ceilearning.com**, where many publications are easily accessible. In the spring at least one day of advanced professional development is provided.

The *SHARE* newsletter is another vehicle for teacher and administrator growth. In each issue are articles written by CEI staff, as well as by other teachers/ facilitators in the schools, that provide ideas for leveraging the power of the ELS lab, along with ideas about other populations of learners who can benefit from participation in the lab. SHARE is, therefore, a networking mechanism for teachers/facilitators and for administrators in the schools.

Another feature of the newsletter is columns written by experts on NCLB compliance, in meeting the needs of learners in the subgroups (such as English-language learners), and in suggesting ways that the features of ELS can assist schools not only in improving student learning, but also in complying with various federal and state mandates. Occasional reports on research and book reviews are included.

At least one implementation meeting is conducted with the principal or other instructional leader for lab supervision. CEI's *Implementation Toolkit* is the text for this session, for it provides critical information on effective implementation, suggestions for consideration, and process definitions. It also includes a job description for the lab facilitator, a checklist of effective lab practices to be used in observations, and a sample or model school improvement plan.

Another level of professional development is provided to the technical staff of the school district. It includes computer specifications, information on the deployment of the software, the benefit of CEI's experience with various network settings and security software issues, and ongoing technical support, including access to the CEI knowledge base.

Awareness-level training on ELS is provided, on request, to grade-level teams, departments, site-based management committees, whole faculties, and central office administrators to build understanding, to facilitate buy-in, and to provide needed knowledge for support and collaboration.

This emphasis on professional development and follow-up is similar to an insurance policy that CEI established for itself and its school partners so that, to every extent possible, a school receives the support it needs for effective implementation—to achieve the desired academic results for their students.

The research findings on this topic are provided in the table below:

Table 42: Research Findings on Professional Development and Follow-up Coaching

Researcher(s)	Findings/Conclusions
Snow, Burns, & Griffin, 1998, p. 331	"Staff development efforts are often inadequate for a number of reasons, including the lack of substantive and research-based content, the lack of systematic follow-up necessary for sustainability, and the one-shot character of many staff development sessions."
Biancarosa & Snow, 2004, p. 20	"Professional development does not refer to the typical one-time workshop, or even a short-term series of workshops, but to ongoing, long-term professional development, which is more likely to promote lasting, positive changes in teacher knowledge and practice."
Kamil, 2004, p. 30	"Research shows that a teacher's professional development can positively affect student achievement, which is sufficiently suggestive to warrant policies that encourage sustained, imbedded professional development for teachers in secondary schools."
Joyce & Showers, 2002, p. 77	". . . this is an important finding—a large and dramatic increase in transfer of training—effect size of 1.42—occurs when coaching is added to an initial training experience comprised of theory explanation, demonstrations, and practice."
Hawley & Valli, 2000, p. 9	"The content of professional development focuses on what students are to learn and how to address the different problems students may have in learning that material. . . . Professional development should be continuous and ongoing, involving follow-up and support for further learning, including support from sources external to the school and can provide necessary resources and outside perspectives."
Hawley & Valli, 2000, p. 9	". . . the ultimate test of the efficacy of the design principles is whether such teacher learning activities lead to changes in teaching that contribute to improved student learning."
Fullan, 1991, p. 91	"One of the reasons that peer coaching works so effectively is that it combines pressure and support in a kind of seamless way."
Sparks, 2002, pp. 1-2.	"Teacher expertise is one of the most important variables affecting student achievement."

Implementation Support

"Educators are hungry for both kinds of details: evidence of exactly how well a method works as well as concrete descriptions of how to make it work."
—Schmoker, 1999, p. 53

Implementation training and an *Implementation Toolkit* are provided to principals, instructional leaders, and technical staff to ensure to every extent possible an effective implementation. CEI also provides facilitators and/or technical staff ongoing technical support on hardware, networking, and software issues.

Table 43: Research Findings on Implementation

Researcher(s)	Findings/Conclusions
ERS, 2002, p. 68	"Research on early intervention programs has concluded that, to be effective, the approaches must be part of a comprehensive, schoolwide plan."
Biancarosa & Snow, 2004, p. 21	"Without a principal's clear commitment and enthusiasm, a curricular and instructional reform has no more chance of succeeding than any other schoolwide reform."
Fullan, 1991, p. 54	"Initiation of change never occurs without an advocate."
Fullan, 1991, p. 76	". . . one of the best indicators of active involvement is whether the principal attends workshop training sessions."
Marzano, 2003, p. 165	"Once a specific intervention is identified, it must be thoroughly implemented if a school is to expect it to impact student achievement. . . . There are many stages of implementation. Just because a school has provided training in a new intervention does not mean that staff members are actually using it. Sadly, many, if not most, interventions are not fully implemented. In fact, it is not uncommon for an intervention to be considered ineffective or marginally effective when, in fact, the intervention was improperly or only partially implemented."
Marzano, 2003, p. 166	"The goal of any intervention is to positively impact student achievement. Therefore, not collecting data on student achievement (once there is some evidence that the intervention has been implemented) is a major mistake—one that can ultimately kill a school reform effort."
Bottoms, Presson & Han, 2004, p. 25	"The differences in achievement behind the high-implementation and low-implementation schools can be directly attributed to the depth to which the two groups of schools have implemented the HSTW design."
Bottoms, Presson & Han, 2004, p. 25	"The high-implementation schools exemplify that the more completely the design is implemented, the higher the student achievement."

Summary

Chapter V discussed four strategies used by CEI to help its partners implement ELS effectively—to get the results they need for improved student performance. The importance of supporting student motivation to learn was included, as well as specific ELS strategies in this area and the SBR findings.

Support for parental involvement, another feature of ELS, was described and documented in the second section.

What CEI believes is a critical insurance policy for effective implementation is its professional development program with follow-up and ongoing coaching.

Lastly, the overall topic of implementation and its research base were examined.

Chapter VI: Additional Research Evidence of ELS Effectiveness

Case Study of the Brazosport Independent School District: The Quest for *Kaizen*

"Quality always leads to increased productivity." –Glasser, 1990, p. 27

When Brazosport ISD, a Texas K-12 district near Houston with approximately 14,000 students, won the first Texas Quality Award given to a school district, the nation's eyes turned to them for strategies on how to improve student performance—how to close the achievement gap, not just narrow it. Within five years, according to Schmoker (2001), every one of its 18 schools achieved "exemplary status" as defined by the Texas accountability system. This meant that

> . . . 90 percent or more of every subgroup—white, black, Hispanic, and economically disadvantaged—had achieved mastery on the state achievement test in reading, writing, and mathematics (p. 102).

In addition to these extraordinary achievements, 93 percent of special education students also passed the state achievement tests.

These improvements did not occur as a result of tweaking at the edges, of implementing only one or two curriculum/instruction changes. Patricia Davenport and Gerald Anderson were the assistant superintendent for instruction and the superintendent of schools, respectively, who led the transformation.
A review of their book, *Closing the achievement gap: No excuses* (2002), reveals many of the steps that they took to change the district and school culture; to assure practices evolving from quality research and effective schools research were implemented; to use the "plan, do, study, act" Deming cycle in the classroom; and to establish dozens of other innovations.

The Brazosport community was on a quest for *kaizen*, the word in Japanese for "a never-ending journey of improvement for oneself, one's family and friends, workmates, community, and, ultimately, the world" (Bonstingl, 1992, p. 37). It is, according to Bonstingl (1992), "an idealistic and optimistic philosophy, to be sure, but one that actually works" (p. 37).

One major commitment made by Brazosport in their determination to become one of the best districts in the nation was to provide remedial/intervention programs for the lowest achieving students (Schmoker, 2001, p. 104). It was one of the ways that they demonstrated that they truly had high expectations for all students, according to Davenport and Anderson: "Our challenge was never clearer: *We had to teach the kind of student that we had not taught before. And we had to believe that we could"* (p. 37). They admitted to each other, they reported, that "good intentions had not always served students well" (p. 37).

In a Brazosport ISD study for 1993-2000 authored by Dr. J. B. Berryhill, who was then the Director of Pupil Personnel, the role that ELS played in that district is explained. "Students were selected to participate based solely on their reading ability" (p. 1). Although the labs served special education, limited-English proficient students, and general at-risk students, the labels were not used in targeting students for services. He wrote: "The model is inclusive in that placement is to assure students with a variety of learning abilities and classifications are assigned to lab periods heterogeneously" (p. 2).

In presenting the test results of BISD students over several years in line graphs that spike upward, Berryhill noted that "Although CEI is not credited as the lone contributor to this success, it is considered as a primary player" (p. 2). He continued, "It would have been impossible to achieve the level of performance from BISD students without improving the reading ability of lower level students" (p. 2). The Brazosport study listed the following innovations to explain their improvements:

- Focus on performance
- Total Quality Management training
- Site-based decision making
- Facilitative leadership training
- Powerful leadership
- Locally-developed eight-step process
- Creative Education Institute (p. 10).

Interestingly, only two of the strategies (one being ELS implementation for struggling readers) on the list were direct interventions with students. One of the strategies, the "eight-step process" was locally developed as a classroom application of Deming's "plan, do, study, act" cycle (Bonstingl, 1992, p. 9). It was described by Davenport and Anderson (2002) as follows:

1. Test Score Disaggregation. Use student test scores to identify instructional groups. Identify weak and strong objective areas.
2. Time Line Development. Develop a campus time line that encompasses all objective areas and time allocations based on the needs of the student groups.
3. Instructional focus. Using the time line, deliver the instructional focus lessons.
4. Assessment. After the instructional focus has been taught, administer an assessment to identify mastery and nonmastery students.
5. Tutorials. Provide tutorial time to reteach nonmastered target areas.
6. Enrichment. Provide enrichment opportunities for mastery students.
7. Maintenance. Provide materials for ongoing maintenance and reteaching.
8. Monitoring. The principal assumes the role of instructional leader and is continuously involved in the teaching and learning process (p. 47).

This model echos many of the SBR-based ELS strategies that have been discussed in this study. First, the overall model is strikingly similar to a mastery learning design discussed in Chapter III. Using test scores for planning and instructional focus are similar to the informed instruction or data-driven decision-making characteristics of ELS, as discussed in Chapter IV. Scheduling adequate time to deliver the focus lessons was, no doubt, based on the research on active engagement and time-on-task discussed in Chapter IV. According to Schmoker (2001), BISD "expanded the traditional reading period—or had students attend not one, but two reading courses if needed" (p. 107). That second period was for participation in an ELS lab. Using formative, ongoing assessments to monitor progress was also discussed in Chapter IV as one of the ELS features grounded in SBR. Reteaching is similar to tutoring (see Chapter III) and the use of practice/repetition discussed in Chapter IV. The important role of the principal in monitoring implementation progress and student growth is similar to the role encouraged for principals in the *ELS Implementation Toolkit*.

A district immersed in strategies proven to be effective would clearly find ELS with its numerous compatible research-based strategies to be a good fit in tts overall plan for improvement.

BISD score graphs documented that "there was a 22-point spread between the scores of the highest and lowest performing students" in 1993, but that gap shrank to only three points in 2000 (p. 2). Few school districts, if any, have been able to effectively close the achievement gap so dramatically.

Subsequent graphs provided the data leading to the following observations:

- In 1994-95 the state special education performance was 47% meeting state standards on state reading assessments, as compared to 60% in BISD. At the end of 2000, the state scores had climbed to 71%, and BISD special education students scored 90%, with BISD testing approximately 20 percent more of its students than the state as a whole (p. 2). In 1994-95 BISD was testing 53% of its special education students on the state assessments, as compared to only 45% in the state average. BISD tested 77% of its special education population in 1999-2000, compared to only 48% for the state average (p. 8).

- BISD also found in analyzing their 1999-2000 *DSTR* scores that testing results indicated only insignificant differences in gains among the various populations of students participating in CEI labs—special education, Title I, limited-English proficient, at-risk, and regular education (p. 3).

- BISD also found that the growth achieved by ELS-participating students continued over time. In a cohort study of those students who participated in 1994-95, their initial scores were compared to the same

> students' scores in 1996 and 1998 in subsequent tests. Data indicate that the percent of students scoring below 60 on the Texas Learning Index consistently decreased, and those scoring at 70 of that index consistently increased (p. 4).

- African-American students made the largest gains in BISD between 1993-94 and 1999-2000. Their reading comprehension scores soared from 68% meeting state standards to 94%, a 26-point improvement. Hispanic students gained almost as much—from 71% to 94%, a gain of 23 points (p. 7).

The conclusion of the report by Berryhill follows:

> The data support the contention that ELS (when properly utilized) will improve students' performance on both norm-referenced tests and the Texas Assessment of Academic Skills (TAAS). Further, and more importantly, the data show that students continue to improve after they no longer are in ELS. It should be noted that ELS was not the only effort taken to improve TAAS scores. However, those efforts were consistently used prior to CEI intervention without success, as indicated by the data presented here. This report indicates that CEI provides a great support to schools' efforts to improve TAAS performance and is extremely effective with students who are considered as the very poorest in reading performance (p. 5).

Schmoker concluded his case study of Brazosport ISD with these comments:

> What Brazosport has wrought, in demolishing socioeconomic differences in achievement, should leave us breathless. But it only attests to something that, in fact, any school system is capable of creating, at which the schools treated here so manifestly excel: a singular, vigilant, and collective focus on results (p. 119).

If CEI did not also manifest that "singular, vigilant, and collective focus on results," it would be doubtful that ELS labs would still be running in Brazosport ISD, especially with a number of administrative changes. But they are. "CEI highly values its long partnership with Brazosport Independent School District, its administrators, its teachers, and its ELS teachers/facilitators, who continue to attest to the powerful impact that ELS has had on student achievement in that district," stated marketing vice president, Ric Klein. Numerous articles about achievement in this district have been published in CEI's SHARE newsletter, and they can be accessed via the webpage.

Correlation of ELS with Deming's Fourteen Points

The following table utilizes The Fourteen Points developed by Dr. W. Edwards Deming, internationally renowned authority in the field of statistical quality control, as interpreted for schools by John Jay Bonstingl (1992, pp. 77-82). ELS program features and services are correlated with that interpretation in the table below.

Table 44: ELS Correlation with Deming's Fourteen Points

POINT	SCHOOLS	ELS
1. Create constancy of purpose for improvement of product and service.	School must focus on helping students to maximize their own potentials through continuous improvement of teachers' and students' work together. Maximization of test scores and assessment symbols is less important than the progress inherent in the continuous learning process of each student.	ELS focuses on the very core of learning problems – faulty sensory processing. It gives educators the tools necessary to monitor student progress to maximize the continuous learning process of each student.
2. Adopt the new philosophy.	School leaders must adopt and fully support the new philosophy of continuous improvement through greater empowerment of teacher-student teams. Cynical application of the new philosophy, with the sole intent of improving district-wide test scores, destroys interpersonal trust, which is essential to success.	CEI strongly believes that human interaction and involvement are key elements in lifelong learning and the ability to make life-changing differences. Therefore, learning solutions are developed to strengthen effective student and educator interaction.
3. Cease dependence on mass inspection.	Reliance on tests as the major means of assessment of student production is inherently wasteful and often neither reliable nor authentic. It is too late at the end of the unit to assess students' progress if the goal is to maximize their productivity. Tests and other indicators of student learning should be given as diagnostic and prescriptive instruments throughout the learning process. Learning is best shown by students' performance, applying information and skills to real-life challenges. Students must	ELS provides an assessment that helps determine a student's primary learning modality, as well as his strengths and weaknesses. This learning system helps the lab facilitator build a prescriptive and sequential lesson plan based on each student's individual learning strengths and deficiencies. ELS uses skill level mastery so each student works on lessons that address his/her individual needs. In the event that a student does not meet the criteria for mastery on a test lesson, the program provides systematic review

POINT	SCHOOLS	ELS
	be taught how to assess their own work and progress if they are to take ownership of their own educational processes.	called "recycling" until the student does achieve mastery.
4. End the practice of doing business on price tag alone.	Build relationships of trust and collaboration within the school, and between school and the community. Everyone's roles as supplier and customer must be recognized and honored. Work together whenever possible to maximize the potentials of students, teachers, administrators, and the community.	CEI is committed to forming a partnership with each client that not only helps those with educational differences achieve academic, social, and professional success, but also gives clients the best support for their development dollar by providing: • Professional workshops; • Customized in-services and staff development presentations; • Ongoing coaching and follow-up; • Faculty and parent orientations; • On-site visits; and • Professional training.
5. Improve constantly and forever the system of production and service.	School administrators must create and maintain the context in which teachers are empowered to make continuous progress in the quality of their learning and other aspects of personal development, while they learn valuable lessons from (temporary) failures.	Each year CEI provides clients with updates, testing materials, software upgrades, resource manual updates, and supplementary materials. CEI also provides clients with toll-free educational and technical support.
6. Institute programs of training.	School leaders must institute programs of training for new employees unfamiliar with the specific culture and expectations of the school. Effective training programs show new teachers how to set goals, how to teach effectively, and how to assess the quality of their work with students. Teachers must also institute programs in which students learn how to set learning goals, how to be more effective in their school work,	All lab personnel who work directly with students receive training in the implementation and operation of the CEI software. CEI's Professional Services team conducts annual workshops so that all CEI clients can share their ideas with other lab personnel. Attendees receive in-depth training on technical issues, current research, practical lab application and motivation. Replacement personnel are trained at no charge.

POINT	SCHOOLS	ELS
	and how to assess their own work. Teachers should show students by attitude and actions what a good *learner* is all about. (Educators learn how to be educators from the modeling they receive as students.)	Experienced trainers conduct the workshops.
7. Institute Leadership.	School leadership consists of working with teachers, parents, students, and members of the community as coach and mentor so that the organizational context in which all students' growth and improvement is valued and encouraged can be maximized by teachers and students, parents, and community members who support the common effort. Leading is helping, not threatening or punishing.	CEI provides administrators with training and an Implementation Toolkit designed to assist them in planning for and implementing CEI's learning solutions in their school. This document includes information regarding material, technical, and staffing needs; program implementation; staff development opportunities; and school improvement planning.
8. Drive out fear.	Fear is counterproductive in school, as it is in the workplace. Fear is destructive of the school culture and everything good that is intended to take place within it. Institutional changes must reflect shared power, shared responsibilities and shared rewards.	CEI provides a sample School Improvement Plan in the "Toolkit," along with a school planning guide. Utilizing this process, schools can include teachers, students, parents ,and administrators in the planning process to instill a collaborative atmosphere in the school. Computer-assisted instruction provides students with a risk-free environment with ongoing feedback and encouragement in which to learn.
9. Break down barriers between staff areas.	Teacher and student productivity is enhanced when departments combine talents to create more integrated opportunities for learning and discovery. Create cross-departmental and multi-level quality teams to break down role and status barriers to productivity.	Students of all ages and levels of education and ability have found success through the use of CEI products. ELS provides opportunities for students from all departments to improve their skills by improving their reading ability. CEI encourages lab facilitators to work collaboratively with other teachers of lab students—sharing assessment results, for instance.

POINT	SCHOOLS	ELS
10. Eliminate slogans, exhortations, and targets for the workforce.	Teachers, students, administrators, families, and community members may collectively arrive at slogans and exhortations to improve their work together, as long as power, responsibility, and rewards are equitably distributed. When educational goals are not met, fix the system instead of fixing blame on individuals.	CEI Results and Recognition. • CEI provides graphic representations of annual pre-and post-test scores to school and district contacts to show overall success, as well as improvements in specific populations and individuals. • The SHARE newsletter contains success stories and profiles of CEI schools, labs, students, and educators. • Students and facilitators receive awards for performance.
11. Eliminate numerical quotas.	Assignments and tests that focus attention on numerical or letter symbols of learning and production often do not fully reflect the quality of student progress and performance. When the grade becomes the bottom-line product, short-term gains replace student investment in long-term learning, and this may prove counter-productive in the long run.	The CEI Learning Manager and ELS provide many features that enable facilitators and students to work more effectively. In addition to simplifying the tasks of organizing and maintaining lab and student information, CLM offers more flexibility and control in analyzing and documenting student progress. By allowing the lab facilitator to select scoring and printing options that best fit the lab environment and the needs of their students, CLM makes the job of communicating student progress easier and more efficient, allowing more time for personal interaction in the lab.
12. Remove barriers to pride and joy of workmanship.	Teachers and students generally want to do good work and feel pride in it. Schools must dedicate themselves to removing the systemic causes of teacher and student failure through close collaborative efforts.	The CEI approach focuses on mastery, positive reinforcement and motivation, all of which can result in significantly improved grade-level equivalents, test scores, self-esteem and overall performance.

POINT	SCHOOLS	ELS
13. Institute a vigorous program of education and retraining.	All of the school's people benefit from encouragement to enrich their education by exploring ideas and interests beyond the boundaries of their professional and personal worlds.	CEI provides initial training for lab facilitators, administrators, school staff, and parents and schedules reviews during the year and annual retraining programs for all personnel needing it. The key to CEI success is having well-trained school staff supporting the learning system.
14. Take action to accomplish the transformation.	School personnel at all levels (including students) must put this new philosophy into action so it becomes imbedded into the deep structure and culture of the school. Teachers and students alone cannot put the plan into effect. Constant top-level dedication to full implementation must be supported by a critical mass of school and community people to implement the plan and make it stick.	CEI manifests that "singular, vigilant, and collective focus on results" noted by Schmoker in his case study of the Brazosport Independent School District (p. 119) as indicated by the ELS labs still running in that district after more than a decade and numerous administrative changes.

CEI's Pre- and Post-Score Analysis

The research provided in this section relating to pre- to post-test score improvements is not scientifically-based, according to the definition provided in law. However, these gains in reading comprehension, as measured on the Diagnostic Screening Test for Reading (DSTR) (Gnagey and Gnagey, 1982) are calculated for thousands of students and have remained somewhat consistent over many years of collecting data. "They are provided by CEI to potential school partners," said Melinda Mace, sales coordinator, "as a way of predicting the kinds of results that schools might achieve with different populations of learners." CEI has summarized the results in population flyers that are available on its webpage under the category of "results."

The data in the following table were collected over several years. They reflect the self-reports from ELS labs who conducted both pre- and post-testing, using the DSTR that is provided with the program as one of the third-party assessments. In other words, the DSTR is not a CEI assessment and thus was not designed in-house to test exactly what is taught in ELS. The measurement reported is reading comprehension.

Table 45: Percent Making Gains in Reading Comprehension, as Measured by the DSTR

Population	-6-Mo.Gain	6-11-Mo.Gain	1-Yr. Gain	2-Yrs. Gain	3+-Yrs .Gain	1+Yrs. Gain	Avg.GE Gain
PreK and K	7.3%	9.1%	49.1%	32.7%	1.8%	83.6%	1.70
Elementary	15.9%	17.3%	32.5%	17.9%	8.4%	58.8%	1.77
Middle School	16.4%	15.0%	27.4%	17.1%	10.1%	54.6%	2.05
High School	19.6%	15.4%	24.2%	15.4%	25.4%	65.0%	2.01
Adult	11.3%	12.9%	30.6%	19.4%	25.8%	75.8%	1.97
At-Risk	14.7%	16.2%	32.9%	16.9%	19.3%	69.1%	1.88
Dyslexic	16.5%	18.2%	30.4%	16.2%	18.7%	65.3%	1.83
Special Ed.	17.2%	18.1%	32.3%	15.4%	17.0%	64.7%	1.75
Limited Eng.	12.1%	14.8%	35.8%	19.4%	17.9%	73.1%	1.95
Title I	12.9%	15.6%	33.5%	20.0%	17.9%	71.4%	1.89

There are some interesting observations to make regarding the data:

- All population groups demonstrated that accelerated learning occurred since all groups gained, on average, more than one year and seven months in one year of instruction.
- Middle school students achieved the largest average grade-equivalent gain—2.05 years of growth.
- High school students achieved the second largest average grade-equivalent gain—2.01 years of growth.
- The largest percentage of students gaining one year or more during a year of instruction was at the PreK-K level—83.6%.
- The second largest percentage of students gaining one year or more during a year of instruction was limited-English proficient students—73.1%.
- The highest percentage of learners achieving three or more years of growth in one year of instruction was adult learners—25.8%.
- The second highest percentage of learners achieving three or more years of growth in one year of instruction was high school students—25.4%.

These findings may be surprising to some since early identification and intervention are so critically important. One might expect the largest growth to occur in the early grades. The results do illustrate that it is never too late to learn. Middle school, high school, and adult students, according to these data,

are some of the learners who have benefited the most from participation in an ELS lab.

Another group with high achievement is the limited-English proficient students. Some bilingual/ESL program directors object to the idea of an intervention for these students since they are not, of course, at risk due to identified difficulties or disabilities as a group. The research provided in this study, however, in the sections on multi-sensory processing, phonics and phonemic awareness to teach the sounds of English, vocabulary, and individualization/differentiation would suggest the reasons there are such strong benefits for this population. Rapid growth in English acquisition is now mandated under Title III of NCLB since limited-English students now must grow at least one level of English-language proficiency each year they are in United States schools and are expected to be fully proficient by their fourth year when they begin to take the state assessments in English.

It would be logical to assume that schools/districts that can achieve their “annual measurable achievement objectives” in exiting increasing percentages from programs for limited-English proficient students and in posting increasing percentages of students who achieve at least one level of growth in English-language proficiency each year would then result in improved scores on the state reading and mathematics assessments. This improved performance of students who are limited-English proficient—or had been—would also improve the aggregate scores for the school, the racial/ethnic subgroup score, and, most likely, the score for the economically disadvantaged.

Special education students are another subgroup that is challenging for schools, especially since the U. S. Department of Education allows only 3 percent of proficient scores to result from alternative assessments. The CEI data indicate that almost 65 percent of special education students gained one year or more from participation in an ELS lab, and a third of those students gained two or more years. Special education students do not typically gain even one year in a year of instruction. If they did, they would not likely be eligible for special education services. These data, then, are truly remarkable and would suggest that ELS interventions in special education might be able quickly to prepare a large percentage of special education students for participation in the general education classroom—and thus prepare them for proficient performance on state assessments.

A problem in interpreting these data is that CEI has no way of knowing if the students not achieving a year of growth were actually enrolled all year, if the students actually received 45 minutes per day of instruction, if they attended school regularly, or if the teacher/facilitator was implementing the lab according to the training, or if lack of motivation was a factor, and so forth. Much is known about the importance of implementation, and without the data on implementation, it is difficult to make a judgment about program effectiveness.

Given the lack of large gaps in the average growth in grade equivalents for the various populations, it would further be interesting to know why it is that elementary schools in general do not achieve the gains of PreK-K in terms of percentages gaining one or more years. A possible cause is that PreK-K participating students may represent the entire class, while participating students at other grade levels have been targeted because of their low achievement.

With the emphasis on accountability that comes with NCLB has come a new emphasis on accountability at CEI. In progress is a plan to hold CEI's educational consultants partially accountable for the results of labs that they serve. At the same time, additional data need to be collected to determine whether there are practices in labs achieving extraordinary acceleration (more than one year for a year of instruction) that could be communicated to other school partners. These actions, no doubt, would improve the percentages of students gaining more than a year in one year of instruction. Additionally, a new emphasis will be placed on keeping principals and other instructional leaders better informed about student progress.

Summary

Departing from SBR, this chapter presented a case study on the Brazosport Independent School District, highlighting the role that ELS played in the erasure of the achievement gap in that district.

Also included was a review of program evaluation data collected by CEI over multiple years and from thousands of diverse schools. These data indicate consistent, accelerated learning gains from all subgroups participating in the ELS program.

Chapter VII: Summary and Conclusions

Several powerful insights and conclusions emerged in the process of conducting this study.

Struggling Readers Are Diverse

The first one is that struggling readers come in all ages and with a variety of disabilities, some inherited, some acquired, and some the result of environment, including weak instruction. The definition of the National Research Council provided by Snow, Burns, and Griffin (1998) follows:

> Children from poor neighborhoods, children with limited proficiency in English, children with hearing impairments, children with preschool language impairments, and children whose parents had difficulty learning to read are particularly at risk of arriving at school with weaknesses in these areas and hence of falling behind from the onset" (p. 5).

An intervention should be considered for any learner not meeting curriculum standards as early as kindergarten or grade 1 and should be mandated thereafter. The costs of ignoring these needs are astronomical for the individual learner and his or her family and for society as a whole. It is a "911" situation—an urgent call for help.

Although the research adds a sense of urgency for early intervention, it is never too late. The older the learner, however, the longer it takes to bring him or her to an acceptable level since the standards for adult literacy are so much higher than they are for young children. Evidence that older learners can learn is found in CEI's data—the pre- to post-test growths experienced by both adolescent and adult learners.

Content Matters—a Lot!

All, or almost all struggling learners, can be taught to read if they can participate in an intervention that includes phonemic awareness, phonics, fluency, vocabulary, and comprehension (NRP, 2000). These five components are mandated because of the strength of the research base. Comprehensive literacy programs include, of course, other components to develop the other domains of the language arts. ELS has not only the five required components, but also elements of all the components recommended by literacy researchers.

Another important insight is that ELS should be seen as a supplementary learning-to-read program for students in the primary grades or as an intervention for older children and adults. Those seeking the proverbial "magic bullet" that will teach all possible literacy knowledge and skills for all kinds of learners are always

going to fail. ELS will have its most powerful impact if carefully situated in a school's overall literacy plan.

Alignment Mandates Make No Sense for Struggling Readers

Although there is certainly a "curriculum" of knowledge and skills in a scientifically-based reading intervention, an intervention curriculum, such as the one designed in ELS, cannot be expected to correlate or align with state curriculum content standards at every grade level. Rather, an educator can expect to see a rather tight alignment with state standards in the early grades, but even from second grade onward, the intervention curriculum should be seen as the "prerequisite" knowledge and skills necessary for students to be able to access the grade-level curriculum.

When a learner does not know how to learn or how to read at a basic level, it makes no sense to require that his or her intervention be rigidly aligned with grade-level curriculum standards. When he or she learns the knowledge and content in ELS, then the grade-level curriculum is accessible and meaningful.

Multi-Sensory Processing Is Critical

The right content is not enough, and that is another important conclusion. The instructional strategies used make major differences in effectiveness. More than adequate research now exists that the use of multi-sensory processing is a critically important component of an effective intervention—since the root cause of most learning failures is faulty sensory processing. It is clear that one of the major reasons that ELS works is its use of the levels of processing in its SHARE activities—efficiently and effectively embedding knowledge and skills into long-term memory.

A related insight is that we now have sufficient evidence to know that when a learner is struggling, there is, simply stated, some kind of difficulty or dysfunction in the brain neurons that results in faulty sensory processing. Instruction must be designed so that the dysfunction is somehow repaired—the student's brain builds or strengthens neural pathways that enable him or her to learn how to read. In the National Research Council's 1999 synthesis of research on "how people learn," they identified key findings from neuroscience and cognitive sciences as follows:

(1) Learning changes the physical structure of the brain.
(2) These structural changes alter the functional organization of the brain; in other words, learning organizes and reorganizes the brain.
(3) Different parts of the brain may be ready to learn at different times (103).

CEI provides that instruction through individualized multi-sensory processing and repeated, varied practice and repetition. Those are some of the reasons why ELS is a "therapeutic intervention."

Instruction Matters, Including Computer Assistance

The right content (phonemic awareness, phonics, fluency, vocabulary, and comprehension) encoded via multi-sensory processing may not be sufficient for the diversity of at-risk learners. Other ELS strategies add power and effectiveness, such as individualization and differentiation, assisted by computer-assisted instruction with research-based screen design, the employment of many opportunities for varied repetition and practice, the inclusion of word families clustered in lessons by their sounds, and the use of assessment results to inform decision-making about instruction. These are examples of not only doing the right things, but of doing things right—according to scientific evidence.

It seems clear now, as well, that although effective literacy instruction is basically the same for all the subgroups with learners who may struggle, the "mix" of strategies vary, depending on the needs, age, prior knowledge, and type of disability (National Research Council, 1998, pp. 2-3). Several researchers make the case that some special education students with cognitive disabilities need not only more explicit and intense instruction, but also something different. CEI provides that individualization through specially designed lesson sequences and through a variety of settings that change lesson parameters. The Teacher's Manual identifies for lab facilitators the appropriate sequences for learners, according to their performances. Further, the lab facilitator is trained to use assessment results and her own ongoing monitoring of student performance to determine the appropriate lesson parameters to keep instruction challenging, yet not too difficult, as well as relevant to the individual needs of the student.

The one-on-one tutoring feature of ELS is invaluable in efforts to improve student performance. The use of computer-assisted instruction makes that possible, as well as makes possible the remarkable degree of individualization and differentiation that is evident in the software presentations. It further, of course, facilitates the multi-sensory processing that is critical in a therapeutic intervention.

Frequent Assessment Is Critical

CEI provides a rich set of assessments for ELS, including dynamic or formative assessments, assessment tasks, mastery lessons, teacher observations, diagnostic instruments (both in-house and third-party), a third-party norm-referenced measurement, criterion-referenced assessments, and alignment with state literacy assessments. New research on assessment practices clarifies the importance not only of ongoing assessment for a variety of purposes, but also of using the results to make next-day instructional decisions. That admonition is

basic to the delivery of ELS. The professional development for lab facilitators includes a major emphasis on making data-driven decisions relating to lesson prescriptions so that instruction is truly "informed." Additional valued features are the use of frequent corrective and encouraging feedback and opportunities for self-assessment.

Implementation Is Critical

Implementation is likewise critical to success. That is why CEI used research in its inclusion of an important role for the teacher/facilitator in its labs. That is also why research-based strategies involving student motivation to learn and parental involvement are included. Also, very important is the professional development with follow-up coaching through a variety of methods. The research on the importance of implementation makes CEI's support services both meaningful and essential in a school's achieving the results it needs. Labs that do not achieve the predicted results invariably have failed to implement appropriately.

Both Sides of the Reading Wars Are Right, Depending on Learner's Needs

Another important insight is that both sides of the reading wars are right—depending on the individual learner's needs. Our reading of the research is that the literature on learning difficulties and disabilities is very clear: those learners have to have something different—a research-based therapeutic intervention that incorporates, among other practices, multi-sensory processing strategies. The National Research Council (1997) made this observation: "The assumption that mastery of basic skills is not a prerequisite for advanced learning appears tenuous for many students with cognitive disabilities" (p. 127). However, "whole language" or "literature-based" literacy programs with emphases on meta-cognition and higher-level writing and comprehension strategies work just fine with many learners. The strategies selected must be appropriate to each learner's developmental stage and needs.

Scientific Research Validates CEI's Pre/Post Scores

Another insight emerged from review of in-house research of annual student growth (disaggregated by subgroup). It is consistently greater than the effect sizes between control and treatment groups in the various studies we reviewed. It can be inferred, then, that when several proven strategies are combined in an intervention, it is legitimate to expect that student gains will increase incrementally and produce even more powerful effects. In other words, although the NRP specifically discounted the validity of pre- and post-test scores to determine effectiveness, CEI's years of analysis of pre- and post-test scores for thousands of diverse students have been consistent and are predictable from the studies we examined. ELS, then, is a package of "best practices," and that is why CEI consistently sees positive, accelerated gains by students participating in its programs.

Scientific Research Validates the Brazosport ISD Experience

Wisdom comes from many sources, and schools can learn much from management and organizational development research, such as the scores of studies conducted on Deming's notions of quality—which are, themselves, strongly grounded in psychological research. Brazosport's obsession with the pursuit of kaizen led them in a very real sense to the districtwide implementation of ELS. They had to have a program to prevent as much failure as possible and/or to treat it at the earliest possible time. Their pursuit of the Texas Quality Award required them to be data-driven in all their processes. The scientific research that lay behind their decisions, including their decision to implement ELS, validates not only their decisions, but also the results recounted in the case study.

ELS Is More Than a Sum of Its Parts

A final, and most important conclusion is that ELS is truly more than a sum of its parts. *All its components are validated through SBR, so it is thoroughly based in scientific evidence*. The chapters in this study have documented a plethora of research findings that support the inclusion of all the component parts of ELS, as well as the validity of its use as a literacy intervention for the diversity of at-risk or struggling learners. To recount, ELS is research-based in the following areas:

- Aligns with the mandates of federal programs that require SBR (see Chapter I discussion and correlations on the webpage and in the appendix);
- Aligns with research on identification of struggling learners (who are at risk) (see Chapter II);
- Reflects the characteristics of literacy intervention programs (see Chapter II);
- Aligns with the characteristics of effective at-risk programs in general (see Chapter II);
- Utilizes multi-sensory processing to get at the root cause of most learning difficulties (see Chapter II);
- Utilizes research-based lesson phases (see Chapter III);
- Utilizes research-based lesson designs, including direct instruction, mastery learning, and one-to-one tutoring (see Chapter III);

- Aligns with the content (phonemic awareness, phonics, fluency, vocabulary, and comprehension) identified by the NRP as critical to literacy instruction (see Chapter III);
- Aligns with the characteristics of comprehensive literacy programs as derived from research (see Chapter III);
- Aligned with the 3-Tier Reading Model, a research-based model guiding Reading First implementation (see Chapter III);
- Reflects the research on computer-assisted instruction (see Chapter IV);
- Reflects the research on computer screen design (see Chapter IV)
- Reflects the research of individualized and differentiated instruction (see Chapter IV);
- Reflects the research on the efficacy of active engagement and time-on-task (see Chapter IV);
- Reflects the research on chunking or clustering (see Chapter IV);
- Reflects the research on repetition or practice (see Chapter IV);
- Reflects the research on frequent, multiple assessments (see Chapter IV);
- Reflects the research on corrective feedback (see Chapter IV);
- Reflects the research on informed instruction (data-driven decisions) (see Chapter IV);
- Reflects the research on self-assessment (see Chapter IV);
- Reflects the research on the importance of motivation and recognition (see Chapter V);
- Reflects the research on parental involvement (see Chapter V);
- Reflects the research on professional development and follow-up coaching for effective implementation (see Chapter V);
- Reflects the research on the importance of sound implementation for effectiveness (see Chapter V);

- Provides a third-party case study of a successful program implementation in Brazosport ISD (see Chapter VI);

- Provides an analysis of pre- and post-test data collected by CEI to measure value-added gains (see Chapter VI);

As Ron Edmonds (1979) remarked, “We can whenever and wherever we choose successfully teach all children whose schooling is of interest to us. We already know more than we need in order to do this. Whether we do must finally depend on how we feel about the fact that we haven't so far." ELS provides a delivery system for the effective teaching of all those students in the at-risk populations. “We already know more than we need in order to do this” because the scientific, theoretical, and evaluation evidence is plentiful and clear.

Thanks

To Peggy Woosley, Stuttgart School District, Arkansas,
for providing customer feedback.

To Linda Austin, grant-writer, Little Rock School District, Arkansas,
for providing customer feedback.

To Peggy and Tom Johnson, Alvord Independent School District, Texas,
for providing customer feedback.

To Nancy Welch, CEI Regional Sales Director, for her input and advice.

To Al Hoekstra, CEI Regional Sales Director, for his review of the outline
and preliminary draft and for his advice.

To Jennifer German for her help in gathering the research and for
reading multiple drafts and giving feedback.

To Robin Wilson for reading multiple drafts and providing assistance
in understanding all the component parts of ELS.

To Melinda Mace for always being helpful and for her care in proofing
the manuscript.

To Sonya Gray for doing everything she could to support the project on a
daily basis.

To Patty Klein for her assistance in proofing and formatting the manuscript.

To Lesley Mullen for her assistance in editing and formatting
the manuscript.

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Appendix A

ELS Correlation to Title I Schoolwide Project Requirements

Title I Requirements	CEI's Role
1. A **comprehensive needs assessment** of the entire school {including taking into account the needs of migratory children as defined in section 1209 (2)} that is based on information which includes the achievement of children in relation to the State academic content standards and the State student academic achievement standards described in section 1111 (b) (1) (D).	CEI recommends that a school committee conduct a comprehensive needs assessment to determine the criteria for selecting the target group of students for participation in the ELS program. For instance, depending on the results of the analysis, a school may target: a. an early grade level to prevent as much later failure as possible; b. the group of students who failed to meet the standards on the last state assessments; c. one or more NCLB subgroups of students who are either not making the AYP or who are on the edge; d. individually identified students who require supplements or interventions based on the criteria established by the school committee. See CEI's *Implementation Toolkit* for models and discussion. See also CEI's *School Improvement Plan (ELS Implementation).*
2.**Schoolwide reform strategies** that— i. provide opportunities for all children to meet the State's proficient and advanced levels of student academic achievement described in section 1111(b) (1) (D);	CEI's mission has always been as follows: "To produce innovative learning solutions that enable people with educational differences to achieve academic, social, and professional success." CEI is a company that believes that "all" means "all." While ELS may serve all students, the program design, development, and implementation are targeted toward those students with educational differences. Students using CEI programs greatly accelerate their learning, for the programs attack the root cause of most school failures: faulty sensory processing. CEI's programs are learning systems that provide students with the learning-to-learn skills that are essential prerequisites for students being able to access and master the state curriculum standards.

Title I Requirements	CEI's Role
ii. use effective methods and instructional strategies that are based on scientifically based research that— I. strengthen the core academic program in the school;	CEI's programs are all totally grounded in research on how people with educational differences can learn to be academically successful. The knowledge and skills are taught that almost come naturally to some, but when not acquired, are devastating to the student. CEI's programs make it possible for increasing numbers of students to be able to access the grade-level curriculum and for the core academic program in the school to be more successful with all students.
II. increase the amount and quality of learning time, such as providing an extended school year and before- and after-school, and summer programs and opportunities, and help provide an enriched and accelerated curriculum; and	Once a school purchases a license for a CEI program, that school owns the license to use during as many hours of the day or week or year that it wishes. Only the numbers of station licenses purchased will limit the number of students who can use the program during any concurrent time. CEI's school partners use the programs in all manner of configurations—during the school day, as a tutoring program, before- and after-school programs, extended-week programs, and extended-year programs. Students' engaged time-on-task is also important in the pursuit of ways to add more learning time. CEI's programs are highly motivating and typically engage students at a high level so little time in class is wasted. Attendance typically improves for students in CEI labs, so, again, learning time is enhanced and increased.

Title I Requirements		CEI's Role
III.	include strategies to address the needs of all children in the school, *but particularly* the needs of low-achieving children and those at risk of not meeting the State student academic achievement standards who are members of a target population of any program that is included in the schoolwide program, which may include— (aa) counseling, pupil services, and mentoring services;	CEI's labs were designed and developed precisely for those students who are "low-achieving" and who are "at risk of not meeting the State student academic achievement standards." ELS's innovative strategies that are based in scientific research include multi-sensory processing, computer-assisted instruction, comprehensive and frequent assessments with results to inform instruction, multiple and varied opportunities for practice, and individualized and differentiated instruction. ELS can serve not only as an intervention for those already identified with learning problems or weaknesses, but also for those students in general who may need a program to prevent their being identified as at-risk. Since the ELS program is grounded in the best language acquisition research and theory, it works well to accelerate the learning of a diverse group of students who may be low-performing: the NCLB subgroups, including students with dyslexia or other learning disabilities, students who are limited-English proficient, low-performing students in Title I programs, and economically disadvantaged students who need academic enrichment and intervention to help them close the learning gap.
	(bb) college and career awareness and preparation, such as college and career guidance, personal finance education, and innovative teaching methods, which may include applied learning and team-teaching strategies; and	CEI's programs provide students with the fundamentals to be successful both in K-12, but also in college and in their careers. Much has been written about the importance for all to be life-long learners, and CEI teaches students how to learn, how to remember, how to recall, how to apply learning, etc. The lab facilitator (who may be a teacher or a paraprofessional) oversees the students in their work, much of which is applying what they have learned. She/he also teaches the lab students in collaboration with the regular classroom teachers for maximum effectiveness.
	(cc) the integration of vocational and technical education programs; and	Much of the vocabulary used in the ELS program come from the world of work and enable students to see real world relationships.

Title I Requirements	CEI's Role
II. address how the school will determine if such needs have been met; and	CEI provides assistance to schools requiring an evaluation of the program effects in several major ways: a. Third-party pre- and post-assessments for use to determine value-added gains and for program evaluation. b. Another third-party assessment to assist teachers in identifying a student's learning strengths and weaknesses. c. An electronic ELS placement test to ensure that students are placed in the program at the appropriate level and configuration to meet their needs. d. An outline on how to set up and conduct a program evaluation. (See CEI's *Implementation Toolkit* for this outline.) e. At the school's request, a graphical analysis of its pre- and post-data. f. CEI staff are available for consultation on an ongoing basis to ensure appropriate student progress and for program evaluation assistance.
iv. are consistent with, and are designed to implement, the State and local improvement plans, if any.	Federal, state, district, and school-level improvement plans invariably focus on those students with "educational differences" and who challenge all the school's resources to move them toward proficient performance. CEI's programs support the school's efforts with those students.
3. Instruction by **highly qualified teachers.**	A school may assign the CEI lab facilitator role to either a highly qualified teacher or to a highly qualified paraprofessional working under the guidance of a highly qualified teacher.
4. In accordance with section 1119 and subsection (a) (4), high quality and ongoing **professional development** for teachers, principals, and paraprofessionals and, if appropriate, pupil services personnel, parents, and other staff to enable all children in the school to meet the State's student academic achievement standards.	CEI expends much of its energy and resources on providing a world-class support program for its school partners, especially in the area of professional development and training. Examples include the following: a. three days of initial training for ELS implementation

Title I Requirements	CEI's Role
	b. ongoing coaching and follow-up for ELS lab facilitators through the year with a certified teacher employed by CEI who is an expert in how to implement a lab effectively; c. provision of a comprehensive Teacher's Manual for ongoing individual learning and technical assistance; d. toll-free and e-mail access to CEI staff for technical assistance and educational consulting; e. at least one day of advanced training during the year (for ELS lab facilitators); f. faculty awareness session to promote schoolwide understanding and support of the program implementation; g. administrator training on effective implementation; h. awareness session, if requested, for central office administrators in charge of the program supervision; i. training for school or district-level technicians on how to install and maintain the software; j. parent education session to explain the program's features and to outline the benefits to the students.
5. Strategies to attract **highly qualified teachers** to high-need schools.	One of the things known is that teachers with a strong sense of efficacy (belief in their ability to be successful) with high-risk students will work in high-need schools and will continue to work there over time. CEI's programs enable such teacher success, as well as student success.

Title I Requirements	CEI's Role
6. Strategies to increase **parental involvement** in accordance with section 1118, such as family literacy services.	The Teacher's Manual and training design for each of the CEI programs include sections on parental involvement. Parent workshops are included. Some schools use the lab for parent education as well. Additionally, the student assessment results are available in report format for parents in both English and Spanish.
7. Plans for assisting preschool children in the **transition from early childhood programs**, such as Head Start, Even Start, Early Reading First, or a State-run preschool program, to local elementary school programs.	Students using CODEBREAKER, CEI's early literacy program, in any early childhood program will learn a great deal of the learning-to-read skills necessary for a smooth transition to kindergarten. CODEBREAKER, aligned with Reading First requirements, includes explicit instruction in phonemic awareness, phonics, fluency, vocabulary, and comprehension. A major benefit to the use of CODEBREAKER in these programs is the acceleration of vocabulary development.
8. Measures to include teachers in the decisions regarding the use of academic assessments described in section 1111(b) (3) in order to provide information on, and to improve, the achievement of individual students and the overall instructional program.	The CEI lab facilitator is intensely engaged in the administration of the several assessments used initially in lab implementation and then through the year. Additionally, she/he is instrumental in the interpretation of the results and then in prescribing the lessons that any individual student needs to meet his/her needs. The lab facilitator is further involved in collaborating with the regular classroom teachers of the targeted students to coordinate instruction for maximal effectiveness. A major role for the teacher/lab facilitator is to monitor student progress and make appropriate adjustments to the student's placement in the program and/or to the lesson parameters, based on the data. The ELS program includes practice and assessment tasks that provide dynamic assessments to monitor student performance, as well as the teacher's observations. In addition, mastery lessons are provided in ELS lesson sequencing with automatic recycling if needed.

Title I Requirements	CEI's Role
9. Activities to ensure that **students who experience difficulty** mastering the proficient or advanced levels of academic achievement standards required by section 1111(b)(1) shall be provided with **effective, timely additional assistance** which shall include measures to ensure the students' difficulties are identified on a timely basis and to provide sufficient information on which to base effective assistance.	Schools sometimes feel overwhelmed with the necessity of providing an individual improvement plan for each student who has been identified as having learning difficulties. CEI's programs can not only assess the student's learning problems, but they can also provide solutions that are highly individualized, keep records about how well the students are doing, provide reports for all involved, and accelerate the student's learning so that academic performance is enhanced.
10. Coordination and integration of Federal, State, and local services and programs, including programs supported under this Act, violence prevention programs, nutrition programs, housing programs, Head Start, adult education, vocational and technical education, and job training.	CEI's programs are aligned with the program goals for Title I, Reading First, Comprehensive School Reform, 21st Century Community Learning Centers, Smaller Learning Communities, and other state and federal programs that address the needs of low-performing and disadvantaged learners. ELS has also been used very effectively in adult education programs, including English-as-a-second language and Adult Basic Education.

Appendix B

ELS Correlation to Comprehensive School Reform Requirements

CSR	CEI
1.Must employ innovative strategies and proven methods for student learning, teaching, and school management that are based on reliable research and effective practices and that have been replicated successfully in schools with diverse characteristics. Campus should investigate research-based methods or strategies—related to reorganization, scheduling, or the use of resources to more effectively support instruction—that have been replicated in schools with similar student diversity, needs, and philosophy. Applicants should provide references to the scientific literature which explain and support the theory behind the design of the school reform program selected. Applicants should also document in the application how the proposed model has been implemented and replicated in schools with characteristics similar to the target schools.	CEI's *Essential Learning Systems* can be implemented with any of the research-based school reform models. ELS's innovative instructional strategies include multi-sensory processing, computer-assisted instruction, individualization and differentiation, multiple and varied opportunities for practice and repetition, and frequent, ongoing assessments that provide data to inform instruction. The ELS Student Manager assists teachers in individualizing, delivering multi-sensory instruction, and in managing student progress through the lessons, as well as assisting in record-keeping.
2. Integrate a comprehensive design for effective school functioning, including instruction, assessment, classroom management, professional development, parental involvement, and school management, that aligns the school's curriculum, technology, and professional development into a schoolwide reform plan designed to enable all students—including students from low-income families, children with limited English proficiency, and children with disabilities—to meet challenging state content and performance standards and that addresses needs identified through a school needs assessment. Programs should address all core subject areas, instruction, school organization, use of time, staff, and available resources and must include all 9-12 grade levels at the campus. Applications that include only piecemeal solutions to comprehensive school reform will not be considered for funding.	CEI designs, develops, and markets learning solutions for students with educational differences—including those from **low-income families, children with limited English proficiency, and children with disabilities**. When the programs are implemented according to our training, the children we serve earn an average of approximately two grade levels of achievement in one year, with some gaining four or more years in that time. *ELS* is a learning-to-learn, learning-to-read, learning-to-remember, and learning-to-apply program, and it impacts achievement across the curriculum. Also, its content is taken from all subject areas.

CSR	CEI
	ELS will assist LEP students in learning English, including the vocabulary of academic English necessary to understand test directions.
3. Provide high quality and continuous professional development and training for teachers and staff. Program-based professional development should be implemented with high-quality assistance and concrete tools, strategies, and materials related to the central focus of the campus' reform program. Professional development activities must be directly tied to improving teaching and learning and student achievement.	CEI's professional development and training include the following for lab facilitators: • three-day initial training for *ELS;* • on-site coaching and follow-up; • one-day advanced training annually; • 24/7 Web access to resources, including research and correlations; • toll-free educational consulting; • toll-free technical support; • frequent newsletters (*SHARE*). In addition, CEI staff provide the following training or professional development: • training for principal and/or instructional leader on effective implementation (See Implementation Toolkit and sample School Improvement Plans.) • awareness sessions for grade-levels or departments and/or for whole faculties to build understanding and support for the program.
4. Have measurable goals for student performance tied to the state's challenging content standards (TEKS) and student performance standards (TAKS) and benchmarks for meeting the goals. Comprehensive school reform gives a campus and its community a shared vision and a common focus on goals. Goals form the framework for the campus' reform efforts, so it is imperative that faculty, students, parents, and community are focused on a set of defined goals developed by the whole group.	Students in CEI labs can be expected to improve their achievement on the following assessments: • Reading Proficiency Test in English • Observation Protocols • Special Education Alternative Assessment • TAKS CEI provides a third-party assessment—*Diagnostic Screening Test: Reading*—that can also be used for program evaluation. Schools are encouraged to administer both pre- and post-tests so that individual student growth, as well as subgroup growth and whole class growth, can be computed. One component of the CEI Service Contract is the preparation of graphical representations of pre- and post-assessment data submitted for school partners.

CSR	CEI
5. Program must be supported by school faculty, administrators, and staff. Campuses must receive the support and approval of the faculty and staff, the district board of trustees, parents, and the community. The higher the level of support and approval, the more likely the reform efforts will be effective and lasting.	Building faculty, administrator, and parent/ community support is a part of the CEI implementation plan (see Implementation Toolkit). CEI staff work with each partner school to deliver workshops for departments, faculties, and administrators to provide them enough information about the program to see how it fits into the school's overall plan for improvement. Parent workshops introduce parents to the lab and show parents ways to monitor and support their children's progress. The CEI Educational Consultant routinely reports to the principal or instructional leader on the findings during lab visits. The EC also makes presentations to faculties and/or school boards to recognize outstanding or exemplary labs and staff. *SHARE*, the bi-monthly newsletter, also provides recognition to schools, school staff, and individual students for their achievements.
6. Provide support for teachers, principals, administrators, and other school staff by creating shared leadership and a broad base of responsibility for reform efforts. The program encourages teamwork and the celebration of accomplishments.	CEI recognizes and supports shared decision-making. Our professional development and training program was designed to provide to all stakeholders the necessary information and skills to enhance quality decision-making.
7. Provide for the meaningful involvement of parents and the local community in planning, implementing, and evaluating school improvement activities.	CEI staff offer parent workshops so that parents can understand and support their children's involvement in CEI programs. Lab facilitators can send parents progress reports on lesson mastery and also the results of pre- and post-testing.
8. Utilize high-quality external support and assistance from a comprehensive school reform entity—which may be a university—with experience or expertise in schoolwide reform and improvement. Applicants must demonstrate in the application that the selected external technical assistance provider has a successful track record, is financially stable, and has the capacity to deliver high-quality materials, professional development for school personnel, and on-site support during the full implementation period of the reform.	Although CEI is not an external entity for comprehensive school reform, it provides supplemental support to the LEA, the school, and the external entity in several ways: 1. We have a successful 18-year track record with documented results over many years and with thousands of students. 2. We are a privately-owned company, and we are financially stable. 3. We deliver high-quality software and supplemental instructional materials. 4. We provide comprehensive professional development and training for the principal or instructional leader and the lab facilitator and awareness sessions for other staff. 5. We provide on-site support through lab visits, and we are always accessible through the Web, toll-free telephone support, and E-mail support.

CSR	CEI
9. Include a plan for the evaluation of the implementation of school reforms and the student results achieved.	See Implementation Toolkit for suggestions for evaluating the CEI program implementation. See also the sample School Improvement Plans. CEI staff can also advise schools in program evaluation design, defining research questions, data collection, and data analysis.
10. Identify how other resources (federal, state, local, and private) available to the school will be utilized to coordinate services to support and sustain school reform.	Not applicable
11. The program must meet one of the following requirements: (1) the program has been found, through scientifically based research, to significantly improve the academic achievement of participating students; (2) the program has been found to have strong evidence that it will significantly improve the academic achievement of participating children.	CEI has several publications documenting our research base and our success, which includes improvements among students from economically disadvantaged homes, students without English language proficiency, and students with disabilities.
12. The LEA must provide technical assistance, evaluation data, and flexibility to the campuses that receive CSR grants. Each applicant must demonstrate in the application how technical assistance, evaluation data, and flexibility will be provided to the participating campus to be eligible for funding.	CEI can assist the LEA in providing ongoing technical assistance and support in the program implementation—both through in-person lab visits by a certified teacher who is an expert in CEI programs and through our Web page, E-mail and toll-free telephone consulting. We support the LEA in providing evaluation data in four ways: 1. The diagnosis of student learning strengths and weaknesses through the *LET-II*, a third-party assessment; 2. The pre- and post-administration of the *Diagnostic Screening Test: Reading*, which will provide a measure of learning growth over the year. 3. The *ELS Placement* test that provides information for lab facilitators to know how to place students in the programs. 4. Ongoing assessment of lesson mastery with daily reports. As a part of our Service Agreement, we also provide graphical representations of the assessment data submitted by our partner schools. These reports can be used in the school's evaluation report. CEI seeks real partnerships with the schools and districts we serve, and we are flexible in defining the services that we can provide.

Appendix C

ELS Correlation to TEA's "Guide to the Evaluation of Digitally Based Reading Programs"

Does the program have evidence of efficacy established through carefully designed experimental studies? *Yes.*

Does the program reflect current and confirmed research in reading? *Yes.*

Does the program provide explicit, systematic instruction in the primary grades (K-3) in the following dimensions:

- phonemic awareness
- phonics
- decoding
- word recognition
- spelling
- vocabulary
- comprehension (listening and reading)
- writing
- oral and written language

Yes. See Chapter III of "Why ELS Works: Its Scientific, Theoretical, and Evaluation Research Base."

Was the program tested in schools and classrooms with similar demographic and learner profiles as your school? *Yes. The program has been successfully implemented in more than 5000 diverse schools across the country. See Chapter VI of "Why ELS Works: Its Scientific, Theoretical, and Evaluation Research Base" for evidence of results.*

Stage II Critical Elements for Analysis of a Digitally Based Program
ELS "Meets Expectations" for the following elements. Chapters cited are from *"Why ELS Works: Its Scientific, Theoretical, and Evaluation Research Base."*

Uniqueness of Technology

Teach phonemic sounds and phonics with or without letter representation.	See Chapter 3.
Provide learners the ability to record and listen to their own voice as they learn to hear, identify and manipulate individual sounds and spoken words.	See Chapters 2, 3, and 4.

Use color and animation to provide an effective way to teach phonological awareness, phonics, vocabulary, fluency, and text comprehension.	See Chapters 3 and 4.
Provide immediate assessment, feedback, prescriptions and documentation.	See Chapters 2 and 4.

Curriculum Integration

System provides a lesson based curriculum—all activities and lessons can be assigned by learning objective to supplement the classroom instruction.	See Chapter 3.
Demonstrated ability to support multiple classroom use models, including unit-based instruction, diagnostic/prescriptive, and project-based learning, and individualized/objective-based models.	See Chapters 2, 3, and 4.
Can be easily used to support basal texts and other learning materials.	See Chapters 2 and 3.
Can be used to introduce concepts and skills, as well as reinforce concept acquisition and skills.	See Chapters 2 and 3.
Curriculum can be broken down to individual learning activities.	See Chapters 2, 3, and 4.
Can be used in varied settings including whole-group, small group, or individual.	See Chapter 5.

Systems Integration and Technical Support

Open systems design—supports modern network and desktop operating systems	See Chapters 4 and 5.
Allows system maintenance functions and security to be performed by non-technical users.	See CEI Implementation Toolkit.
Provides integrated desktop security—safeguards system files and programs without the need to purchase or install and maintain additional software.	See CEI Implementation Toolkit.
Technical support available in varied models to support district including web, telephone, and on-site models.	See Chapter 5 and CEI Implementation Toolkit.

Management and Reporting

Management system provides automatic lesson sequencing.	See Chapters 1, 2, 3, and 4.
System allows teachers to easily find and assign activities or lessons by state learning objectives.	See Chapters 1 and 2.

Allows educators to easily individualize instruction to support the learning objectives of an Individualized Education Plan.	See Chapters 2 and 4.
Provides instructor with ability to adjust mastery level of instructional activities as appropriate.	See Chapters 2, 3, and 4.
Allows teachers and administrators to track the progress of individual students and classes by designated subgroups.	See Chapters 1, 2, and 4.
Student database demographics are customizable, extensible, exportable student demographics.	See CEI Implementation Toolkit.
Student database would allow for the automatic import/export of data.	See CEI Implementation Toolkit.
Student self analysis.	See Chapter 4.
Parental communication and involvement.	See Chapter 5.

Assessment

Assessment tool should consist of items that not only cover objectives contained on the NAEP, State assessments and AYP measures, and also identify the prerequisite skills needed for success.	See Chapters 1, 3, and 4.
Assessment items should be validated items.	See Chapter 4.
Assessment tool should allow teachers to identify objectives to be assessed and the resulting test results should create an individualized student prescription in reading, for every student based on the mastery/non-mastery of objectives, irrespective of whether previous mastery was exhibited.	See Chapter 4.
Ability to create benchmark assessment to monitor on-going progress (data driven decisions).	See Chapter 4.
Test items should mirror both content and format to those on the NAEP and the other major standardized assessments.	See Chapter 4.
System automatically prescribes instruction based on student performance.	See Chapter 4.
System automatically creates and assigns an individualized cumulative review for students.	See Chapter 4.
Assessment tools allow educators to adjust mastery levels for courses, classes and individual students to support high standards for all students.	See Chapter 4.
Provides summative data.	See Chapter 4.

General Curriculum

Provides a consistent scope and sequence with depth and breadth that is developmentally appropriate.	See Chapter 3.
Appropriate instructional design strategies used to develop consistent curriculum content.	See Chapter 3.
Courses and lessons are highly interactive and engaging—goes beyond "question and answer" format and follows effective teaching practices.	See Chapters 3, 4, and 5.
Students are required to apply multiple skills in solving complex problems.	See Chapter 3.
Activities provide real world, cross-curricular learning opportunities.	See Chapters 2, 3, and 4.
Lessons provide all learners with opportunities to apply higher order skills and demonstrate performance.	See Chapters 2, 3, and 4.
Students are required to perform by writing in all curriculum areas, not just reading.	See Chapter 3.
Allows individual students to determine speed of lesson completion.	See Chapters 2 and 4.

Phonemic Awareness/Phonics

Uses visual cues and auditory discrimination to present the sounds of phonemes.	See Chapters 2 and 3.
Provides picture cues that do not use letter representation.	See Chapters 2 and 3.
Provides visual and auditory modes of phonemic isolation.	See Chapters 2 and 3.
Recognition of the same sound phonemes in the beginning or ending of a word.	See Chapter 3.
Blending of separate sounds into a word.	See Chapter 3.
Breaking or segmenting a word into unique sounds.	See Chapter 3.
Use of oral rhymes to facilitate phonemic awareness.	See Chapter 3.
Provides activities for phoneme blending and segmentation.	See Chapter 3.
Emphasize alphabetic knowledge by the use of activities that teach learners their ABCs including activities for awareness, sound, shape, alphabetic order, and words associated with beginning sounds.	See Chapter 3.
Provides phonics instruction that is systematic and explicit.	See Chapter 3.
Improve word recognition and spelling.	See Chapter 3.
Improve reading comprehension.	See Chapter 3 and 6.
Prove effective for children from various social and economic levels.	See Chapters 1, 2, 3, and 6.
Practice in writing letters, words, messages, and stories through the use of extended activities and materials.	See Chapter 3.

Vocabulary

Introduces specific words before reading.	See Chapter 3.
Provides extended instruction to promote active engagement with vocabulary.	See Chapter 3.
Provides working age appropriate dictionaries for vocabulary development.	See Chapter 3.
Provide opportunities to see the word, hear the word, say and record the word, hear the word repeated.	See Chapters 2 and 3.
Provides for definition and application of the word.	See Chapter 3.
Teaches the use of context clues in vocabulary instruction.	See Chapter 3.
Teach sounding the word out.	See Chapter 3.

Fluency

Models fluency.	See Chapter 3.
Asks the learner to read with the computer or choose to read aloud.	See Chapter 3 and 4.
Highlights by phrases and clauses, turning to chunks.	See Chapters 3 and 4.
Provides voiced passages in all PK-3 reading instruction for the understanding of intonation and emotion in reading passages.	See Chapters 2, 3, and 4.
Ability to record the student's voice to provide practice as the learner reads connected text.	See Chapters 2 and 4.
Models fluency at different rates and with the use of different tones.	See Chapters 2, 3, and 4.
Provides learner the opportunities to read and hear the readings as many times as necessary.	See Chapters 2 and 4.

Text Comprehension

Teaches strategies for text comprehension.	See Chapter 3.
Provide comprehension strategies beginning with word analysis and evolve into comprehension.	See Chapter 3.
Include use of before reading, during reading, and after reading activities.	See Chapter 3.
Use of direct instruction to teach learner to monitor text by taking student back to story and uses a direct explanation to help learner apply the strategy.	See Chapter 3.
Uses guided practice as a strategy for text comprehension.	See Chapters 3 and 4.
Use of sound, animation, and colorful graphics to help the learner create a mental image of reading.	See Chapters 2, 3, and 4.
Encourages students to visualize and imagine as they read with exploratory sessions.	See Chapters 2 and 3.

Instructional Programs and Materials
Materials and Programs

Prioritize essential skills and strategies.	See Chapters 2 and 3.
Sequence skills and strategies in a logical, coherent manner.	See Chapter 3.
Demonstrate and build the relationships between fundamental skills leading to higher order skills.	See Chapter 3.
Focus on activities that relate directly to the learning objectives.	See Chapter 3.
Provide specific suggestions for learners with special needs.	See Chapters 2, 3, and 4.
Provide a combination of online and offline materials.	See Chapters 3 and 5.
Provide extension through parental involvement materials for home use.	See Chapter 5.

Differentiated Instruction
Instructional Materials

Provide a range within the instructional materials which allow flexibility to start students at different entry points in the materials depending on student performance.	See Chapters 2, 3, and 4.
Suggest appropriate grouping based on students' performance.	See Chapter 4.
Recommend and accommodate flexible groupings to maximize student performance.	See Chapter 4.
Present comprehensive guidance for teachers in providing effective, efficient instruction for students with special needs.	See Chapters 2, 3, 4, and 5.
Provide explicit and systematic instruction and practice materials to accelerate reading achievement for students who are reading significantly below grade level.	See Chapters 1, 2, 3, 4, 5, and 6.

Professional Development

Provides professional development support for use of technical components of programs.	See Chapter 5.
Provides alignment to state and district standards.	See Chapter 1.
Offers integration strategies for use of digitally based programs into core reading.	See Chapter 3.

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