Questions

1. What are effective instructional strategies or practices to help teach early elementary students (Grades 1–3) who are mildly apraxic or dyslexic to read?¹
2. Does a dysgraphia diagnosis impact a student’s reading ability and/or fluency?

Background

REL Midwest received a request for information on effective instructional strategies or practices to teach elementary students who are mildly apraxic or dyslexic to read, as well as on how a dysgraphia² diagnosis may impact a student’s reading ability and/or fluency. The REL Midwest Reference Desk conducted a search for research and resources in response to these questions, which have been organized into three following sections that respectively address instructional practices and interventions for teaching students with dyslexia or apraxia, as well as the relationship between dysgraphia and other reading learning disabilities.

Following an established REL Midwest research protocol, we conducted a search for research reports as well as descriptive and policy-oriented briefs and articles on dyslexia and apraxia. We focused on identifying resources that specifically addressed reading instruction and intervention. The sources included ERIC, federally funded organizations, additional research institutions, several educational research databases, and a general Internet search using Google, Google Scholar, and other search engines.

We also searched for appropriate organizations that may act as resources on this issue. We have not done an evaluation of these organizations or the resources themselves but offer this list to you for your information only.

¹ Note: For this particular request, studies in the report were limited to those examining English-speaking student populations.
² A diagnosis of dysgraphia refers to the condition of being unable or struggling to learn how to write (primarily in regard to handwriting).
1. What are effective instructional strategies or practices to help teach early elementary students (Grades 1–3) who are mildly apraxic or dyslexic to read?

**Reading Instructional Practices for Students With Dyslexia**


*From ERIC abstract:* “To provide clinicians with evidence-based strategies to facilitate early speech development in young children who are not readily imitating sounds. Relevant populations may include, but are not limited to, children with autism spectrum disorders, childhood apraxia of speech, and late-talking toddlers. Method: Through multifaceted search procedures, we found experimental support for 6 treatment strategies that have been used to facilitate speech development in young children with developmental disabilities. Each strategy is highlighted within this article through a summary of the underlying rationale(s), empirical support, and specific examples of how it could be applied within intervention. Conclusions: Given the relatively sparse experimental data focused on facilitating speech in children who do not readily imitate, theoretical support emerges as particularly key and underscores the need for clinicians to consider why they are doing what they are doing. In addition, this review emphasizes the need for the research community to bridge the gap between pressing clinical needs and the limited evidence base that is currently available.”

*Note: We were unable to locate a link to the full-text version of this resource. Although we try to provide publicly available resources whenever possible, we determined that this resource may be of interest to you. It may be found through university or public library systems.*


*From ERIC abstract:* “This longitudinal study focused on the effects of two different principles of intervention in children at risk of developing dyslexia from 5 to 8 years old. The children were selected on the basis of a background questionnaire given to parents and preschool teachers, with cognitive and functional magnetic resonance imaging results substantiating group differences in neuropsychological processes associated with phonology, orthography, and phoneme-grapheme correspondence (i.e., alphabetic principle). The two principles of intervention were bottom-up (BU), “from sound to meaning,” and top-down (TD), ”from meaning to sound.” Thus, four subgroups were established: risk/BU, risk/TD, control/BU, and control/TD. Computer-based training took place for 2 months every spring, and cognitive assessments were performed each fall of the project period. Measures of preliteracy skills for reading and spelling were phonological awareness, working memory, verbal learning, and letter knowledge. Literacy skills were assessed by word reading and spelling. At project end the control group scored significantly above age norm, whereas the risk group scored within the
norm. In the at-risk group, training based on the BU principle had the strongest effects on phonological awareness and working memory scores, whereas training based on the TD principle had the strongest effects on verbal learning, letter knowledge, and literacy scores. It was concluded that appropriate, specific, data-based intervention starting in preschool can mitigate literacy impairment and that interventions should contain BU training for preliteracy skills and TD training for literacy training."

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From ERIC abstract: “In this study, 123 children with a diagnosis of developmental dyslexia were assigned to different treatment groups, either variations of Bakker’s intervention program based on the balance model or a control, a specific reading training group. Thorough cognitive and neuropsychological assessment allowed determination of the subtype of dyslexia according to the balance model and the neuropsychological profile with respect to reading and spelling abilities, verbal memory, and phonemic awareness. Characteristics of hemisphere-specific stimulation were systematically manipulated in an effort to shed light on the bases and mechanisms of reading improvement. It was shown that the effects of treatment vary according to type of dyslexia and that the different intervention programs have differential effects on reading-related neuropsychological functions. Since the opposite effects can be produced by the same type of treatment in different dyslexia subtypes, the results of the study suggest that accurate classification of subtype on the base of reading and reading-related variables is advantageous for an optimal planning of the therapy.”

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From the abstract: “Students with learning disabilities (LD) represent a significant proportion of students enrolled in U.S. schools. Research suggests that students with LD in reading benefit from specialized reading instruction, and effective reading instruction can be characterized as explicit, intensive, and systematic. Examples of evidence-based interventions that follow these principles for students across grade levels are reviewed.”

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*From ERIC abstract:* “Dyslexics read concrete words better than abstract ones. As a result, one of the major problems facing dyslexics is the fact that only part of the information that they require to communicate is concrete, i.e. can easily be pictured.

**Method:** The experiment involved dyslexic third-grade, English-speaking children (8-year-olds) divided into two groups. One group was given syllabic logograms that supported drawings made by assembling stenographic strokes (syllables). The dyslexic control group did not receive the drawings. In this study we compared reaction times of two groups of dyslexic children of 22 pupils each, one supported with logograms and one without as a control group. Results: The data gathered from these reading tests suggest that logograms can help dyslexic children form links between the syllables of a word and its corresponding image. Conclusions: The results of the present study may aid in interpreting the data on the recognition of abstract words and production tasks with dyslexic children.”


*From the website:* “This report summarizes 12 peer-reviewed, high-quality research studies between 1995 and 2005 and synthesizes their findings on the effects of extensive reading interventions (comprising at least 100 instructional sessions) for struggling K–3 readers. It then explains the related implications for practice for students with reading problems or learning disabilities in an RTI setting.”


*From the abstract:* “The authors compared the effects of 3 kindergarten intervention programs on at-risk children’s subsequent reading and spelling skills. From a sample of 726 screened kindergarten children, 138 were selected as children potentially at risk for dyslexia and randomly assigned to 1 of 3 training conditions: (a) letter-sound training, (b) phonological awareness training, and (c) combined training in phonological awareness and letter knowledge. A control group of 115 unselected (“normal”) kindergarten children was recruited to evaluate the training effects. Results indicated that the combined training yielded the strongest effects on reading and spelling in Grades 1 and 2. Thus, these findings confirm the phonological linkage hypothesis in that combining phonological awareness training with instruction in letter-sound knowledge has more powerful effects on subsequent literacy achievement than phonological awareness training alone. (PsycINFO Database Record (c) 2010 APA, all rights reserved).”
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From the introduction: “The search for effective remedial methods for children with dyslexia has a long and productive history (Clark and Uhry, 1995). However, it is only quite recently that objective information has been available in sufficient quantities to provide reliable answers to even basic questions about remedial interventions for older children with serious reading disabilities. The primary goal of this chapter is to describe and justify a few of the most important conclusions from recent research on remedial interventions for children with dyslexia. Along the way, we will also discover a number of critical areas in which there is currently a glaring lack of useful information.”


From ERIC abstract: “The relative effectiveness of two computer-assisted instructional programs designed to provide instruction and practice in foundational reading skills was examined. First-grade students at risk for reading disabilities received approximately 80 h of small-group instruction in four 50-min sessions per week from October through May. Approximately half of the instruction was delivered by specially trained teachers to prepare students for their work on the computer, and half was delivered by the computer programs. At the end of first grade, there were no differences in student reading performance between students assigned to the different intervention conditions, but the combined-intervention students performed significantly better than control students who had been exposed to their school’s normal reading program. Significant differences were obtained for phonemic awareness, phonemic decoding, reading accuracy, rapid automatic naming, and reading comprehension. A follow-up test at the end of second grade showed a similar pattern of differences, although only differences in phonemic awareness, phonemic decoding, and rapid naming remained statistically reliable.”


From the report: “The Lindamood Phoneme Sequencing® (LiPS®) program (formerly called the Auditory Discrimination in Depth® [ADD] program) is designed to teach students the skills they need to decode words and to identify individual sounds and blends in words. Initial activities engage students in discovering the lip, tongue, and mouth
actions needed to produce specific sounds. After students are able to produce, label, and organize the sounds with their mouths, subsequent activities in sequencing, reading, and spelling use the oral aspects of sounds to identify and order them within words. The program also offers direct instruction in letter patterns, sight words, and context clues in reading. LiPS® is designed for emergent readers in kindergarten through grade 3 or for struggling, dyslexic readers. The program is individualized to meet students’ needs and is often used with students who have learning disabilities or difficulties. The version of the program tested here involved computer-supported activities…. One study of LiPS® that falls within the scope of the Students with Learning Disabilities review protocol meets What Works Clearinghouse (WWC) evidence standards. The study included 50 students with learning disabilities from eight to ten years of age in three elementary schools in Florida. Based on this study, the WWC considers the extent of evidence for LiPS® on students with learning disabilities to be small for alphabetics, reading fluency, reading comprehension, writing, and math” (p. 1).


From the abstract: “Students with learning disabilities (LD) represent a significant proportion of students enrolled in U.S. schools. Research suggests that students with LD in reading benefit from specialized reading instruction, and effective reading instruction can be characterized as explicit, intensive, and systematic. Examples of evidence-based interventions that follow these principles for students across grade levels are reviewed.”

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Reading Instructional Practices for Students With Apraxia


From ERIC abstract: “This study explores the importance of production frequency during speech therapy to determine whether more practice of speech targets leads to increased performance within a treatment session, as well as to motor learning, in the form of generalization to untrained words. Method: Two children with childhood apraxia of speech were treated with an alternating treatment AB design, with production frequency differing in the 2 treatments. The higher production frequency treatment required 100+ productions in 15 min, while the moderate-frequency treatment required 30–40 productions in the same time period. One child was treated 3 times weekly for 11 weeks; the other child was treated twice weekly for 5 weeks. At the conclusion of each treatment phase, 5 min of probes were administered to determine whether generalization had occurred. Maintenance data to measure performance and learning were collected after a break from treatment. Results: Both children showed improvement on all targets; however, the targets with the higher production frequency treatment were acquired faster,
evidenced by better in-session performance and greater generalization to untrained probes. Conclusions: Both treatment designs were effective, though frequent and intense practice of speech resulted in more rapid response to treatment in 2 children whose primary communication difficulty was childhood apraxia of speech.”

Note: We were unable to locate a link to the full-text version of this resource. Although we try to provide publicly available resources whenever possible, we determined that this resource may be of interest to you. It may be found through university or public library systems.


*From ERIC abstract:* “This study investigated the effectiveness of an integrated phonological awareness approach for children with childhood apraxia of speech (CAS). Change in speech, phonological awareness, letter knowledge, word decoding, and spelling skills were examined. A controlled multiple single-subject design was employed. Twelve children aged 4–7 years with CAS participated in two 6-week intervention blocks (2 sessions per week), separated by a 6-week withdrawal block. Nine children with CAS made significant gains in their production of target speech sounds and these demonstrated transfer of skills to connected speech for at least one speech target. Eight children showed significant gains in at least one target phoneme awareness skill, and these children demonstrated transfer of skills to novel phoneme awareness tasks. As a group the children with CAS demonstrated improvement in phonological awareness, letter knowledge, word decoding, and spelling ability. An integrated phonological awareness programme was an effective method of simultaneously improving speech, phoneme awareness, word decoding, and spelling ability for some children with CAS.”

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2. Does a dysgraphia diagnosis impact a student’s reading ability and/or fluency?


*From the abstract:* “Programmatic, multidisciplinary research provided converging brain, genetic, and developmental support for evidence-based diagnoses of three specific learning disabilities based on hallmark phenotypes (behavioral expression of underlying genotypes) with treatment relevance: dysgraphia (impaired legible automatic letter writing, orthographic coding, and finger sequencing), dyslexia (impaired pseudoword reading, spelling, phonological and orthographic coding, rapid automatic naming, and
executive functions; inhibition and rapid automatic switching), and oral and written language learning disability (same impairments as dyslexia plus morphological and syntactic coding and comprehension). Two case studies illustrate how these differential diagnoses can be made within a conceptual framework of a working memory architecture and generate treatment plans that transformed treatment nonresponders into treatment responders. Findings are discussed in reference to the importance of (a) considering individual differences (diagnosis of impaired hallmark phenotypes) in planning and evaluating response to instruction and modifying instruction when a student is not responding; (b) recognizing that teaching may change epigenetic gene expression at one stage of schooling, but not the underlying gene sequences that render individuals still vulnerable as curriculum requirements increase in nature, complexity, and volume in the upper grades; and (c) using evidence-based diagnoses of specific learning disabilities that are consistent across states for free and appropriate education K to 12 and for accommodations throughout higher education and professional credentialing.”

**Additional Organizations to Consult**

- Florida Center for Reading Research  
  [www.cse.ucla.edu](http://www.cse.ucla.edu)  
  *Description*: The Florida Center for Reading Research (FCRR) is a part of the National Center for K–12 Instruction in Reading, Mathematics, and Science. Part of the Comprehensive Center network, the Center on Instruction is one of five content centers serving as resources for the 16 regional U.S. Department of Education Comprehensive Centers. FCRR is responsible for the reading strand of the center.

- National Center for Learning Disabilities  
  [www.ncld.org](http://www.ncld.org)  
  *Description*: The National Center for Learning Disabilities (NCLD) works to “connect parents and others with resources, guidance, and support, so they can advocate effectively for their children; deliver evidence-based tools, resources and professional development to educators to improve student outcomes; and develop policies and engage advocates to strengthen educational rights and opportunities” (from NCLD website). The website includes a section called “Especially for Teachers” with a subsection called “Effective Teaching Practices.”

- Reading Rockets  
  [www.readingrockets.org](http://www.readingrockets.org)  
  *Description*: Reading Rockets is a national multimedia literacy initiative funded by a grant from the U.S. Department of Education, Office of Special Education Programs. The website includes information and resources on research-based strategies to help teach children to read.
Keywords and Search Strings Used in the Search

“dyslexia” OR “apraxia” AND “instruction” OR “intervention” AND “reading”

Search of Databases and Websites

**Institute of Education Sciences (IES) Sources:** Regional Educational Laboratory Program (REL); IES Practice Guides; What Works Clearinghouse (WWC); Doing What Works (DWW), Institute of Education Sciences (IES), National Center for Education Research (NCER), National Center for Education Evaluation and Regional Assistance (NCEE), National Center for Education Statistics (NCES)

**Other Federally Funded Sites:** National Center for Learning Disabilities (NCLD), Center on Instruction, Florida Center for Reading Research (FCRR)

**Additional Data Resources:** ERIC, Google Scholar, Google, Reading Rockets

Criteria for Inclusion

When Reference Desk researchers review resources, they consider—among other things—four factors:

- **Date of the Publication:** The most current information is included, except in the case of nationally known seminal resources.

- **Source and Funder of the Report/Study/Brief/Article:** Priority is given to IES, nationally funded, and certain other vetted sources known for strict attention to research protocols.

- **Methodology:** Randomized controlled trial studies, surveys, self-assessments, literature reviews, policy briefs. Priority for inclusion generally is given to randomized controlled trial study findings, but the reader should note at least the following factors when basing decisions on these resources: numbers of participants (just a few? thousands?); selection (Did the participants volunteer for the study, or were they chosen?); representation (Were findings generalized from a homogeneous or a diverse pool of participants? Was the study sample representative of the population as a whole?).

- **Existing Knowledge Base:** Although we strive to include vetted resources, there are times when the research base is slim or nonexistent. In these cases, we have included the best resources we could find, which may include newspaper articles, interviews with content specialists, organization websites, and so on.

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